metal

the news digest magazine

Volume XXVIII-No. 1 January, 1955

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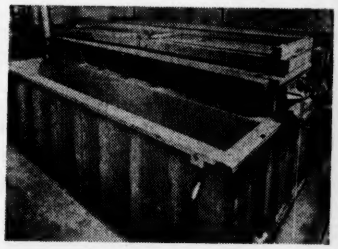

Aluminum Heat Treating

Desanding—Descaling
18,000 lbs. per hr.—1800 KVA

(See Back Cover)

THE A. F. HOLDEN COMPANY

THREE F.O.B. POINTS—LOS ANGELES, DETROIT and NEW HAVEN

P.O. Box 1898	3311 E. Slauson Avenue	11300 Schaefer Highway
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Position Open on ASM Staff . . .

- This director of metals engineering education for ASM should have superb qualifications as a metallurgist (preferably a Ph.D. degree) but he should be much more than a scientist—he should be one who cares deeply about the practical consequences and the day-by-day usefulness of applied metallurgy in industry.

- He should have a conviction that metallurgical engineering can be brought to occupy a much larger place in industrial affairs than it does today. He should feel that the soundest method for achieving this larger place and recognition is through a broad program of adult education, which he will administer. He should understand instinctively the needs of design engineers and process engineers for this type of supplementary training in metals, and should be able to sense the still broader opportunities inherent in the training of large numbers of subprofessional technicians, draftsmen and production supervisors along the same lines.

- He should be able to glimpse a future metalworking industry in which metallurgy is the recognized and respected basis for all operations and in which a very large number of engineering and supervisory production personnel will have a common understanding of the importance of metallurgy because of their participation in the ASM correspondence courses in metals engineering.

- The man selected for this position should, of course, have the ability to plan and evaluate instructional materials. No less important, he should be endowed with the personal qualities and the persuasiveness necessary to win friends for this program among the top managements of metalworking companies as well as his colleagues in the headquarters' staff.

- He should be capable of growing with his own program, for this activity, skillfully administered, may justifiably become the largest department of the ASM.

- The new appointee, a metallurgist of 35 or under, might be either a young man who now contemplates leaving a university post and who has had some prior industrial experience, or one who now heads a small group or department in industry and has had some previous teaching experience which he enjoyed. The responsibilities and starting salary will be commensurate with those of a full professor of metallurgy in a leading universty.

- Please send a resume of your qualifications and experience to:

W. H. Eisenman, Secretary
American Society for Metals
7301 Euclid Avenue
Cleveland 3, Ohio

Metals Review

VOLUME XXVIII, 1 January, 1955

THE NEWS DIGEST MAGAZINE

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CONTENTS

IMPORTANT LECTURES

DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

A. S. M. of Tomorrow

Progress is born in the dreams of men—but progress must be practical . . . it must be useful and helpful to a vast community of people to carry great weight and meaning.

Such is the progress exemplified in the stirring, far-reaching program of A.S.M. of Tomorrow . . . a program conceived and fashioned by William H. Eisenman and destined to become one of the truly great achievements of our time.

Here is the discussion of the first of the 5-points of the Program of the A.S.M. of Tomorrow outlined by Mr. Eisenman before A.S.M. members at the annual meeting in Chicago, Nov. 3 1954.

I am deeply grateful for the distinguished honor the members of the American Society for Metals have bestowed upon me in electing me for the 19th consecutive two-year as its Secretary. The 36 years already served have prepared me, I feel, to take a look into the metallurgical world of tomorrow—and, from my experience and my faith in the future of the A.S.M., to present to the Board of Trustees and to the membership a plan of progressive, dynamic expansion and progress safely within A.S.M.'s splendid economic capacities.

So, if I may have your indulgence for a few minutes, I will unfold to you the new fields of activity the Society is prepared to, and, in my humble judgment, should, enter. Here is a forward look towards the American Society for Metals of Tomorrow.

The A. S. M. of Tomorrow

One should not be so busy and occupied with present activities that he fails to recognize the dawn of a new day with new possibilities for increased service and the need for an alert and forward look.

I would not for a moment have you feel that the thoughts expressed on the projected activity here unfolded represent the last word in just how and when they might be placed in operation. The real purpose I have in mind now is to present the broad picture of great possible future usefulness of the American Society for Metals, not to give minute details of its operation, but to show how projected activities dovetail into a picture of tomorrow.

The American Society for Metals of Tomorrow, as I foresee it, will be a gradual progression from one phase of accomplishment to the next, an evolution springing from the present firm and substantial base of service—a base created through 36 years of growth and advancing preparation for the tremendous opportunities that should now be attacked with vigor and comprehension.

And here is the first of the five phases of the recommendations and proposals I make, with a full discussion of each of the other four to follow in succeeding issues of *Metals Review*.

I. Erection of Adequate Headquarters Building

I wish to present first a few facts about a new headquarters building.

The necessity for a new headquarters building, as well as a new location, has already been recognized and approved by the Board of Trustees. The present quarters at 7301 Euclid Ave. in Cleveland are externally and internally attractive but inadequate in size and undesirable as to location, due to business neighbors, the surroundings, and also the personal safety of employees and property. Also, the present site and buildings are economically unsound.

The site and headquarters building fund, including the appropriations already made, and exclusive of all other assets of the Society, now total $500,000, and it is expected that by the time the building location and plans have been approved, the fund will total more than one million dollars. A committee is now actively searching for a site, either within city limits of Cleveland or in a suburban area which would be easily accessible and where the value of the land has not been inflated, but has every prospect of a very substantial increase in value.

Nondestructive Testing Methods Outlined

Robert B. Oliver, Oak Ridge National Laboratory, Presented a Talk on "Current Methods of Nondestructive Testing" at a Meeting in Chattanooga. He is shown with officers of the Chapter, from left: L. N. Wall, secretary-treasurer; Ab Flowers, chairman; Mr. Oliver; R. E. Lorentz, Jr., technical chairman; and Jack Stocker, vice-chairman of the Chapter

Speaker: Robert B. Oliver
Oak Ridge National Laboratory

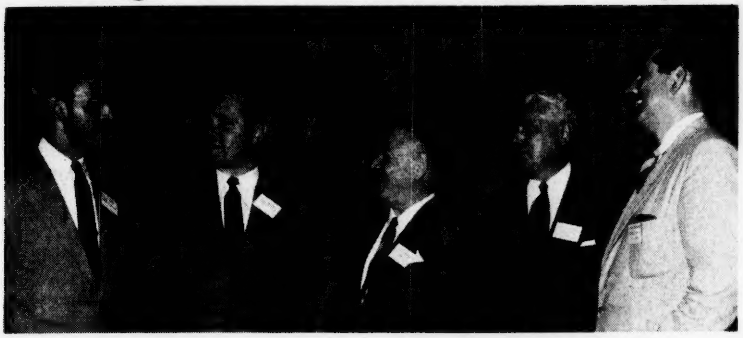
"Current Methods of Nondestructive Testing" were discussed at a meeting of the Chattanooga Chapter by Robert B. Oliver, senior metallurgist in charge of testing, Oak Ridge National Laboratory.

Mr. Oliver explained how modern methods of nondestructive testing had their greatest impetus during the war due to shortages of time and material, and have continued to be important in terms of saving machining and material costs by proving methods to be good on complete, whole samples. Weights and strengths formerly thought necessary for safety can be lowered when nondestructive testing proves the absence of weak points. Sales forces, as well as engineers, can use test results to advantage.

Defining nondestructive tests as any test which does not destroy the sample while testing, Mr. Oliver then described the current methods. He stressed the importance of experience and skill in interpretation of test results on the part of the operator. Methods described included radiography, with descriptions of X-ray machines now available, and radioactive isotopes which can be obtained from Oak Ridge, which gives small laboratories and plants economical radiation sources.

Magnetic particle and oil penetrant methods were next discussed. The use of the helium leak detector and metal sorting tests, which depend on the variation in field resistance and conductivity, were explained and illustrated, and new advances in ultrasonic methods were illustrated by slides showing equipment and characteristic wave patterns obtained with sound and defective materials.—**Reported by J. H. McMinn for Chattanooga Chapter.**

Chicago Holds National Officers Night



A.S.M. President G. A. Roberts, Vice-President in Charge of Technology, Vanadium-Alloys Steel Co., Spoke on "Toolsteels—New Developments and Applications" at the National Officers Night Meeting of the Chicago Chapter. Pictured are, from left: Joseph Kubik, Stewart-Warner Corp., chairman; Dr. Roberts; National Secretary W. H. Eisenman, who presented a discussion on the National Metal Congress and Exposition; Adolph J. Schied, Jr., Columbia Tool Steel Co.; and Carl H. Samans, Standard Oil Co. (Indiana), vice-chairman. (Reported by C. W. Saenger for the Chicago Chapter)

Factors to Consider In Machining Steels

Speaker: Ford E. Dreves
Wyckoff Steel Co.

Ford E. Dreves, metallurgical engineer, Wyckoff Steel Co., presented an address entitled "Machining Cold Finished Steel" at a meeting of the **New Jersey Chapter**.

Mr. Dreves described cold finishing operations such as cold drawing, straightening, turning, and centerless grinding or polishing, which are used either singly or in combination.

Mr. Dreves pointed out that the old term "cold rolled steel" is still frequently used by consumers, whereas they should specify either cold drawn or turned and polished, depending on their requirements on those sizes where the operations overlap. The hardness induced by cold drawing penetrates to the center of the bar and is not merely "skin" effect as is commonly believed. The residual stresses set up in cold drawing round bars are reduced somewhat when they are "Medart" straightened; however, they are concentric. Where distortion is a factor, as in the case of eccentric machining, cold drawn bars are often stress relieved. In the larger sizes, a turned and polished bar is used where the mechanical properties are characteristic of hot rolled stock.

Cold drawing improves the machinability, particularly in the low and medium carbon steels, by hardening the ferrite constituent which reduces the ductility. Theoretically, for optimum machinability, the steel should be soft and brittle. With additions of alloying elements such as phosphorus and nitrogen, ferrite ductility is reduced. The addition of inclusion-forming elements, such as sulphur, has improved machinability by providing minute brittle particles throughout the metal. These particles pulverize on machining to act as a lubricant and prevent a built-up edge on the cutting tool, thus reducing the chip-to-tool friction. These additions, together with cold drawing, bring the low-carbon screw stocks nearer that "soft and brittle" machinability goal. Lead, which is sometimes added, is mechanically dispersed as submicroscopic particles that further lubricate the tool edge.

The most common factors affecting machinability are size, shape and distribution of iron carbide, which is hard and abrasive. The optimum structure in low and medium carbon steel and medium carbon alloy steel is moderate sized grains of lamellar pearlite. High carbon steel requires a spheroidized structure for best machinability. These microstructures are produced, of course, by suitable heat treating.

Mr. Dreves concluded his talk by stating that while the cold finished material can be selected to produce generally suitable stock, the optimum conditions do vary; therefore, the best results are achieved when the cold finishing mill is advised of the conditions and problems of production.—**Reported by E. L. Novomesky for New Jersey Chapter.**

Discusses Solidification At Savannah River Meeting

Speaker: F. N. Rhines
Carnegie Institute of Technology

F. N. Rhines, professor of metallurgy at Carnegie Institute of Technology, spoke before the **Savannah River Chapter** at a recent meeting. His talk, "Solidification of Metals", included a review of nucleation theories and a discussion of growth and segregation.

In answer to specific questions from his audience, Dr. Rhines explained the decrease in the solubility of hydrogen in aluminum during solidification and its effect upon porosity.—**Reported by E. A. Wick for Savannah River.**

Register for K.C. Educational Course

Shown Registering for the Educational Course on "Introductory Metallurgy" Currently Being Given by John Nelson, Marley Co., for the Kansas City Chapter, Are a Group of the Participants in This Basic Metallurgy Course, Consisting of Lectures and Laboratory Experiments. As the 60 students who registered for the course indicated an interest in an advanced course in metallurgy, the Chapter is making plans to conduct such a course in the Spring. (Reported by Bill Alderson for Kansas City Chapter)

Awards Golfing Trophy at Milwaukee

E. G. Guenther, Secretary of the Milwaukee Chapter, Awards the Golfing Trophy to Robert C. Clark, General Manager, Genoa Centrifugal Casting Co., Inc., Which He Won at the Chapter's Annual Golfing Party in June

25 Societies to Cooperate in 9th Western Metal Show

Twenty-five technical societies are cooperating with the American Society for Metals in sponsoring the Ninth Western Metal Congress and Exposition in Los Angeles Mar. 28 to Apr. 1, 1955.

The Congress will be held in the Ambassador Hotel, and the Exposition in Pan-Pacific Auditorium—largest exhibit building in the West. The American Society for Metals, the American Foundrymen's Society, American Welding Society, Industrial Heating Equipment Association, the Society for Nondestructive Testing and others will hold sessions as features of the Congress.

Societies co-sponsoring the Show and Congress, as announced by Edgar C. Buckingham, cooperating societies chairman of Los Angeles Chapter A.S.M., and field service engineer, Pacific Scientific Co., Los Angeles, are:

American Society for Metals, American Ceramic Society, American Electroplaters Society, American Foundrymen's Society, American Institute of Mining and Metallurgical Engineers—Metals Branch, American Ordnance Association—Los Angeles Post, American Society of Civil Engineers, American Society of Heating and Ventilating Engineers, American Society of Mechanical Engineers—Southern California Section, American Society of Refrigerating Engineers, American Society of Safety Engineers, American Society for Testing Materials, American Welding Society, California Society of Professional Engineers—Los Angeles Chapter, Industrial Heating Equipment Association, Institute of the Aeronautical Sciences — Los Angeles Section, Institute of Radio Engineers, Pacific Coast Enamelers Club, Pacific Coast Gas Association, Purchasing Agents Association of Los Angeles, Society for Nondestructive Testing, Society of Automotive Engineers, Society of Women Engineers, Southern California Industrial Safety Society, and Structural Engineers Association of Southern California.

Technical Papers Invited for A.S.M. Transactions

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1956 *Transactions* and probable presentation before a national meeting of the Society. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the Society.

Many of the papers approved by the Committee will be scheduled for presentation on the technical program of the 37th National Metal Congress and Exposition to be held in Philadelphia, Oct. 17-21, 1955. Papers that are selected for presentation will be preprinted. Manuscripts should be received at A.S.M. headquarters office not later than April 11, 1955.

Acceptance of a paper for publication does not necessarily infer that it will be presented. The selection of approved papers for the convention program will be made early in June.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers, illustrations and drawings will be gladly forwarded.

Cleveland Hears Talk On Powder Metallurgy

Speaker: John D. Shaw
S-K-C Research Associates

The **Cleveland Chapter** heard an address entitled "Powder Metallurgy Today" by John D. Shaw, president, S-K-C Research Associates.

The newest operation now used in producing compacted powdered metal is "roll bonding". Instead of using closed dies to contain the powdered metal during pressing, the powder is pressed into strip by direct rolling. This means that the powder is fed between a set of rolls with a predetermined gap and comes out in the form of a relatively weak but continuous "green" metal strip. The bite or nip angle of the rolls is of the order of 6 to 7°. The "green" or unsintered strip holds together surprisingly well. After the first roll bonding, a piece of strip can be picked up and will not break apart. These mills can roll strip at the rate of approximately 30 ft. per min. The roll bonded strip can then be fed directly into the sintering furnace. The initial sintering period must, for practical purposes, be short, since otherwise an excessively long sintering furnace would be required. Subsequent rolling and annealing steps are used, with the anneal time periods being of the same order as those used for conventional strip. After sintering and reduction to the finished size, the metal has a 100% density.

The most recent strip products made have shown an absence of macro and microscopic voids and on test have exhibited properties similar to those produced by conventional procedures. Rods and shapes can also be produced by this method.—**Reported by J. J. Skarda for Cleveland.**

Canton-Massillon Hears How Stainless Steels Are Extruded

Speaker: A. G. Cook
Allegheny Ludlum Steel Corp.

The **Canton-Massillon Chapter** heard A. G. Cook describe the "Hot Extrusion of Stainless Steel". He described the application of the relatively old extrusion process to the fabrication of steel shapes and tubing. Mr. Cook is extrusion metallurgist at the Watervliet, N. Y., plant of Allegheny Ludlum Steel Corp.

After a brief history of the extrusion process and discussion of the limitations imposed by lubrication problems and high temperatures, Mr. Cook showed how the development of glass lubrication made the hot extrusion of stainless steel practical.

Allegheny Ludlum was licensed in 1950 to use the Ugine-Sejournet process and began construction of an integrated plant for extrusion of steel. The plant contains a 1500-ton extrusion press, a 600-ton piercing press and a 200-ton blanking press, equipment for cold drawing stainless steel tubing and pickling facilities.

A typical sequence of operations was described, beginning with a turned or ground billet. The billet is heated in a salt bath, rolled over a table covered with powdered glass and loaded into the extrusion press. The mandrel is lubricated by placing powdered glass in the billet. The press closes rapidly, the billet is upset and the steel is extruded through the die. Extrusion speeds may reach 1700 ft. per min. for the product, or 700 in. per min. on the ram. When extrusion is complete, the stem and mandrel retreat and the product is hot sawed, leaving the discard in the container.

After ejection of the discard, the die is removed and cleaned, several dies usually operating in circuit. An extrusion is produced every one or two minutes in this way.

For shapes other than tubing, a solid billet is used with an appropriate die. Extrusion ratios vary from 5:1 to 50:1. Most of the 300 and 400 series stainless steels and several toolsteels have been extruded and titanium and zirconium have been extruded on an experimental basis.

One of the advantages of the extrusion process is its versatility. No time is lost in changing shapes since the die is changed for each extrusion. Billet surface condition and the application of the proper analysis and physical form of the glass are factors which strongly influence the quality of the product.

Physical properties of the extrusions were said to possess surprisingly little anisotropy. Relative freedom from decarburization in the extruded toolsteel product is considered an advantage of the process.

Three major reasons were advanced for the use of extrusions: Small quantities can be extruded economically because of the relative magnitudes of roll and die costs; intricate shapes which are difficult to roll can be extruded; and some materials can be extruded which cannot be rolled.—**Reported by W. E. Littmann for Canton-Massillon.**

Describes Manufacture And Applications of Iron At Fort Wayne Meeting

Speaker: F. B. Rote
Albion Malleable Iron Co.

F. B. Rote, technical director, Albion Malleable Iron Co., spoke on "Manufacture and Applications of Iron" at a meeting of the **Fort Wayne Chapter.**

Dr. Rote gave a general discussion of the structures and properties of cast irons (gray irons, nodular irons, permanent mold iron, malleable iron and pearlitic malleable iron). His discussion covered the manufacturing methods for each iron and an explanation of how the different methods will affect the final product.

Dr. Rote pointed out how carbon affects castability, tensile properties, ductility, machinability and damping capacity in products made from irons. The properties of irons are controlled by the graphite content and its size, shape and distribution. The three types of graphites described were flake, nodular and spheroidal. Controlling the graphite is a big factor for production, according to Dr. Rote.

Following the talk a film on "Malleable Metal", which illustrated modern foundry production methods, was shown.—**Reported by Lee Van Fossen for Fort Wayne.**

Briefs Minnesota on the Titanium Industry's Growth

Speaker: T. W. Lippert
Titanium Corp. of America

The **Minnesota Chapter** heard T. W. Lippert, manager of sales and technical service, Titanium Corp. of America, give a highly interesting talk on the "Development and Growth of the Titanium Metal Industry". It was only five years ago that the first sheet of commercial titanium was produced and today it is a quarter of a billion dollar a year business and still growing tremendously.

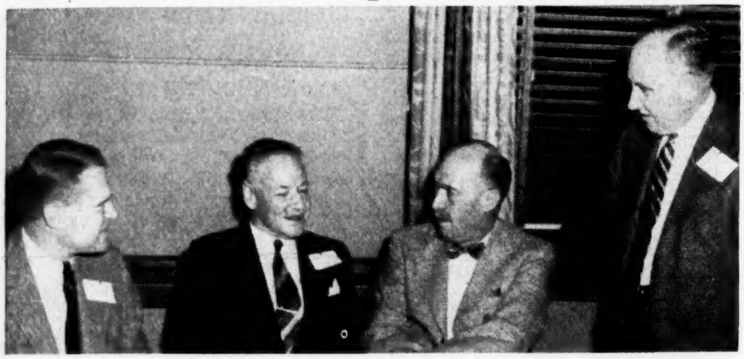
Titanium alloys are particularly useful in the aircraft industry where extremely high corrosion resistance and strength with light weight are demanded. The substitution of titanium alloy in the jet engines of one of our latest bombers resulted in a weight saving of up to 12,000 lb. per plane. The army ordnance engineers are also anxiously examining the possible uses of this metal. Annealed titanium alloy has a yield strength of approximately 130,000 psi. with only one-half the weight of steel, so its desirability is easily seen. Titanium alloys can also be heat treated (solution treatment plus aging) to strengths up to 200,000 psi.

At the present time, the titanium industry cannot meet the heavy demand for titanium alloys. New plants are being built to raise production from 30,000 tons per year to 75,000 tons per year. The future growth of the industry is limited only by the ability of the titanium engineers and scientists to overcome and improve particularly difficult production problems. Rapid progress is being made to reduce the high cost and widen the applications where it is not economically feasible at the present time. —**Reported by Lyle W. Gutsche for Minnesota Chapter.**

Presents Science Award in Erie, Pa.

John Bartram, Academy High School Student, Erie, Pa., Is Shown Receiving an A. S. M. Science Achievement Award for His Entry on the "Four Color Problem". Present were, from left: John M. Hickey, superintendent of schools; Miss Ethel Ruhling, biology teacher who sponsored Bartram; John Bartram; Norman McDonald, coordinator of Sciences of the Erie School District: and Joseph J. Zipper, Gannon College. (Reported by W. Roth)

A.S.M. President Speaks at Milwaukee



National President G. A. Roberts (Left) Spoke on "Properties and Structures of Alloy Toolsteels" at the National Officers Night Meeting of the Milwaukee Chapter. Shown to Mr. Roberts' left are: W. H. Eisenman, national secretary, J. Fletcher Harper, who presented Mr. Eisenman with a badge from the first Metal Show, held in 1919, and Wilson Trueblood, chapter chairman. (Reported by E. H. Schmidt; Photo by N. Thorkildsen)

Describes Forming And Applications of Titanium at Calumet

Speaker: Tom E. Perry

Republic Steel Corp.

Tom E. Perry, Republic Steel Corp., spoke at the Calumet Chapter on "Forming and Uses of Titanium," at a meeting held recently. Mr. Perry was assigned to help lay the groundwork when Republic Steel began its titanium development program. His duties have encompassed production, research and development, and field contact work.

Mr. Perry talked about the past six years of industrial development and the process problems encountered with this extremely reactive metal, and presented the properties which make titanium so attractive to industry.

Titanium is light weight, tough, has high strength and excellent corrosion resistance. Its weight is about 56% of the weight of steel. It is stronger than iron in the pure state and compares to heat treated steels in the alloyed condition. The metal can be welded with excellent toughness. Titanium is stronger in the pure form than most metals. There is an abundant North American ore supply in Southern Quebec, Mexico and Florida.

About 95% of the titanium production in the United States has been used in military aircraft, where its light weight, strength and corrosion resistant advantages have been utilized. It replaces stainless steel and aluminum on many applications and is used for fire walls, fuselage skins and structural sections, and other airframe and engine parts.

Nonmilitary uses have been limited mainly because of price. A few exploratory applications have been made in chemical plant equipment, food process equipment, orthopedic devices, anodizing racks and others. Some of these applications have proven very worthwhile even at present prices.

With the aid of slides, Mr. Perry showed aircraft applications and fabrication techniques. Applications in jet-engine components, including compressor wheels, bearings, wheels, blades and housings were shown. Ordnance equipment included the mortar base plate where titanium is used for its light weight and strength characteristics. Titanium has been used for outriggers for field pieces, in what was probably the first commercial welding of titanium by fusion techniques in an inert-gas atmosphere.

Titanium ingots are poured in water-cooled copper molds under an inert atmosphere. Ingots are machined about ¾ in. on the diameter before processing and are forged at 1500 to 1800° F. Commercially pure titanium is rolled at 1250° F.; alloys are rolled about 50° F. higher. The finishing temperature is about 1000° F. and there is no hot short range.

The rule book for fabrication problems is being written. No set procedures are yet possible. Mr. Perry listed, however, tentative rules and recommendations for sheet forming and bending by the following methods: V-block bending, power brake, drop hammer, hydropress, spinning and dimpling. In conclusion he presented some of the industry-wide problems still receiving major attention. These problems relate to uniformity of product, control of interstitials, elevated temperature stability of highly stressed parts and flatness tolerances on light-gage sheet product.—**Reported by C. A. Michaels for Calumet.**

Pueblo Group Brought Up-to-Date on Research

The Pueblo Group of the **Rocky Mountain Chapter** heard Edmund S. Davenport, assistant to the vice-president in charge of research and technology, United States Steel Corp., speak on "Research in the Steel Industry". He augmented his lecture with slides which pictured the methods and equipment used in industrial research and a film of selected high-speed photography shots used in research analysis. A complete report of Dr. Davenport's talk appears on p. 13 of this issue.—**Reported by H. L. Newton for Rocky Mountain-Pueblo Group.**

Wins Pittsburgh Golf Trophy for Year

At the Annual Golf Party Held by Pittsburgh Chapter, Norman Tisdale, Jr., (Left), Won the A.S.M. Golf Cup for One Year. He is shown receiving it from Herbert Turnbull, member of the entertainment committee. Other activities at the party included volley ball, horseshoes, putting, cards, free beer and a buffet supper. (Reported by Dave Spehar for Pittsburgh)

Heat Treating Course Draws Top Attendance

A Record-Breaking Total of 280 Registered for the Four-Lecture Course on "Heat Treatment" Conducted by Benjamin Averbach, Professor of Metallurgy at Massachusetts Institute of Technology, for the Boston Chapter. The program was arranged by William F. Collins, Chapter Educational Committee, assisted by Harold Stuck and Gerald Buckert. Registrants were invited to attend the regular Chapter meeting in November to hear a panel of experts speak on heat treatment. (Reported by M. B. Graham for Boston Chapter)

Lubrication Aspects of Rolling and Forming Sheet Is Topic at Mahoning

Speaker: James McElgin
E. F. Houghton & Co.

James McElgin, manager of the metallurgical department, E. F. Houghton & Co., presented a talk on "Lubrication and Metallurgical Aspects of Rolling and Forming Sheet Steel" at a meeting of the **Mahoning Valley Chapter.**

Mr. McElgin stated that the primary function of a drawing compound is to provide lubrication, preventing metal-to-metal contact between the work piece and the die. Also, by decreasing sliding friction, it reduces power requirements and increases the die life. In the first place, it must serve under conditions of "boundary" lubrication and under conditions of extremely high pressures. It must also resist the heat developed by internal friction.

A lubricant may perform two distinct types of lubrication, depending upon the pressure to which it is subjected, its composition and its viscosity. First is total liquid lubrication, in which a liquid film effects the complete separation of two sliding metal surfaces. Bearing lubrication up to about 4500 psi. pressure is an example of this type. Second is boundary lubrication, in which incomplete separation of the sliding metal surfaces is provided by an organic film. The range of pressures is 4500 to 450,000 psi. Examples are deep drawing, wire drawing and cold extrusion.

Among the most important characteristics required in a compound are: (a) high film strength, to resist frictional heat and pressure during plastic deformation; (b) oiliness or lubricity, to reduce and control the friction between work and die; (c) wetting-out properties, to keep the surface tension low and to spread sufficiently under pressure to form a protective film; and (d) noncorrosiveness, to prevent staining and pitting of dies and work.

Drawing compounds may be comparatively simple or may be a complex mixture of ingredients, each to lend some desirable property. For example, a base of chemical reactors, sulphur and chlorine compounds may be added to soaps, fatty oils or mineral oils for resistance to welding, galling and build-up. Pigments of various types (calcium carbonate, graphite, mica, lead and zinc oxides) are used in the heavy duty drawing compounds.

New extreme-pressures agents and combinations have been developed which permit the use of light-bodied oils or emulsions in place of the heavily pigmented products. Colloidal pigments are also being used.

On extremely heavy drawing operations where pigmented compounds or surface-active agents cannot be used (such as work which is to be vitreous enameled), polar-type lubricants are being employed. This has made possible the drawing of one-piece steel bathtubs and sinks.—**Reported by John D. Anderson, Jr., for Mahoning Valley.**

Problems in Brittle Fracture

Speaker: W. J. Harris, Jr.
Battelle Memorial Institute

The **Notre Dame Chapter** welcomed eight new members and heard a technical address by William J. Harris, Jr., consulting scientist, Battelle Memorial Institute, on the "Brittle Fracture of Steel", at a recent meeting.

After reviewing the serious problems involved in brittle fracture in ships and other structures, Dr. Harris acquainted his audience with the new post-war steels that have been developed to solve this problem, but indicated that there is much yet to be done. He indicated that in case of a national emergency, the mills would be unable to cope with the situation and that the real solution was still in the hands of metallurgists who must come up with something just a little better.—**Reported by R. C. Pocock for Notre Dame.**

Compares Old and New Steel Works

Robert L. Stockus, Farrel-Birmingham Co., Inc., Presented a Discussion on "Modern Rolling Mill and Extrusion Press Equipment and Practices" at a Meeting of the New Haven Chapter. To illustrate the progress that has been made in the rolling of metals, he contrasted the first American iron works at Saugus, Mass., with present-day mills and equipment in the Pittsburgh area. Shown are, from left: Earle W. Lovering, chairman; G. F. Schaefer, Farrel-Birmingham Co., Inc.; Mr. Stockus; and E. Scala, technical chairman. The talk was preceded by a visit to Farrel-Birmingham in the afternoon. (Reported by Fred E. Storm for New Haven)

North Texas Presents Exhibit Award

At the Sustaining Members Night Meeting of the North Texas Chapter, Fred McKimball, Southwestern Gage Co., Was Presented the Chapter's Trophy Award for the Most Outstanding Display in an Industrial Exhibit of Sustaining Members' Products. Pictured, from left, are: Irving Comroe, vice-chairman; John M. Turbitt, chairman, holding the trophy; L. R. "Dutch" Meyer, who presented a talk on "Football in the Southwest"; and J. P. Fowler, secretary. (Reported by R. E. Hopper for North Texas)

Lehigh Valley Chapter Hears Roberts

National President George Roberts Presented His Talk on "Powder Metallurgy of Alloy Steels" at a Meeting of the Lehigh Valley Chapter. Present at the meeting were, from left: Arnold F. Kindt, chairman; Bradley Stoughton, past national president; Dr. Roberts; B. F. Shepherd, past national president; and D. A. St. Clair, Bethlehem Steel Co., technical chairman of the meeting. (Reported by F. H. Ulrich for Lehigh Valley)

Cites Factors to Consider In Selection of Corrosion Resisting Materials

Speaker: Frank L. Whitney
Monsanto Chemical Co.

At a joint meeting of the Rochester Chapter and the local chapter of the National Association of Corrosion Engineers, Frank L. Whitney, corrosion consultant, Monsanto Chemical Co. and president N.A.C.E., presented a talk on the "Selection of Corrosion Resisting Materials".

Mr. Whitney introduced his subject by advancing three prime considerations, material, environment and economics, as the basis for any corrosion resisting material selection. His talk was devoted to the factors related to these considerations and examples of each.

With reference to material considerations, advantages are realized in construction and maintenance if a material is available in all forms. The material should lend itself to ease of fabrication. For example, in considering the use of tantalum, field repair by the user may not be practical, and the metal must be reworked by the manufacturer. Lead may resist the action of sulfuric acid at elevated temperatures, but it is undesirable because of its greatly lowered physical and mechanical properties at these temperatures. In the working of the material, stamped stainless steel bubble caps will stress corrosion crack in the presence of chlorides. An example of heat treatment corrosion was given, as follows: A high-pressure, high-temperature steel autoclave was stress relieved at 1300° F., which did not remove spheroidized pearlite in the microstructure resulting from the welding operation. Corrosion resulted with this microstructure. Normalizing at 1600° F. proved a remedy for this problem. In composition control, in certain phosphoric acid exposures, AISI type 316 with chromium near 16% is unsatisfactory, whereas AISI type 316 with chromium near 17.5% is satisfactory.

Concerning environment considerations, corrosion attack generally increases with temperature. Concentration of chemicals has varying corrosive effects and velocities above 5 FPS in copper-zinc alloy pipe are apt to produce corrosion-erosion. In certain applications, too low a velocity may cause deposition of solid matter, thereby producing concentration cell attack.

A summarized economic study showed ¾-in. thick steel with corrosion rate equaling 112 mils per year to be the choice over ¼-in. thick Everdur, monel or 304 stainless, with corrosion rates of 31, 25 and 3 mils per year, respectively.—**Reported by S. Gamlen for Rochester Chapter.**

Aluminum Alloy Heat Treatment Discussed At New Jersey Meeting

Speaker: K. B. Baker

Aluminum Co. of America

Following a vivid and colorful film on the use of aluminum on the construction of Alcoa's new headquarters building in Pittsburgh, Kenneth B. Baker, chief works metallurgist of the Edgewater Plant, Aluminum Co. of America, presented a talk on "Aluminum Alloy Fabrication and Heat Treatment" at a meeting of the New **Jersey Chapter.** He explained that he would not attempt to cover the entire field but would take up important topics in detail, stressing their practical everyday aspects.

With the aid of a film strip, Mr. Baker explained the derivation and usage of the new system of alloy designation adopted by the Aluminum Association in October 1954.

The basic metallurgical differences between heat treatable and nonheat-treatable aluminum alloys were discussed. One of the principal features of the heat treatable alloys is that the alloying elements form intermetallic compounds which are more soluble at high than at low temperatures. Solution heat treatment puts these compounds into solid solution in the matrix; rapid quenching holds them in solution until an aging or lower temperature treatment allows them to precipitate out, thereby hardening the metal. The chief difference between the naturally ageable and artifically ageable alloys is that the minimum precipitation temperature of the former is at or below room temperature.

The speaker then gave some particular points in connection with aluminum heat treating, stating that it is very important that the solution temperature be held within the range specified for each alloy, since too high a temperature may induce eutectic melting and too low a temperature would not produce the full effect. Rapid quenching from the solution temperature is also very important and care must be used in any reheating done. In connection with annealing, it was recommended that slow heating rates and excessive times at heat be avoided. With the precipitation hardening alloys, a slow cooling rate to permit coalescence of the precipitants is effective in obtaining maximum softening effect.

On the subject of corrosion, the speaker pointed out that while aluminum in general is more corrosion resistant than many other metals, some aluminum alloys, such as the nonheat-treatable ones and the magnesium-silicide types, are better than others in this respect. He pointed out that surface conditions are quite important; dirt accumulations on the surface or moisture held in contact with it, as in the case of wet wrapping materials, are conducive to corrosion. Alkaline solutions are usually more corrosive to aluminum alloys than acids. Galvanic corrosion may be prevented by avoiding contact with dissimilar metals or their oxide residues. Protection of aluminum may be accomplished by anodizing, various chemical treatments or painting.—**Reported by H. B. Fernald for New Jersey Chapter.**

Points Up Problems in Manufacture of Bearings

Speaker: H. O. Walp

S.K.F. Industries, Inc.

H. O. Walp, chief metallurgist, S.K.F. Industries, Inc., spoke on the "Metallurgy of Bearing Steels and Bearing Problems" before a meeting of the **Philadelphia Chapter.**

Sales of the bearing industry, the largest user of high-quality steel, amounted to 700 million dollars in 1953. There are two commonly used grades—carburized and SAE 52100, with most bearings being made from the latter. Minimum hardness for bearings and races is Rockwell C-58.

Most failures start as fatigue cracks originating as much as 0.060 in. under the surface. Magnaflux does not reveal defects at that depth. Mr. Walp pointed out, however, that a bearing is not necessarily defective if magnaflux inspection indicates surface defects because the point of maximum stress is below the depth at which magnaflux is effective.

Nonmetallics are a source of fatigue failure, although they are not considered harmful up to 0.015 to 0.020 in. Defects are less harmful if they are globular.

Failures also occur where there are no inclusions. Thorough investigations of the parts has, at times, revealed the presence of ferrite. These local points of soft ferrite initiated fatigue failures.

Bearings are easily damaged in grinding and it is standard practice to etch bearings for grinding burns.

Vacuum-melted steels tend to produce bearings which give longer life, although much remains to be done on this subject.—**Reported by Frank R. Romeo for Philadelphia.**

Gives Relationship of Metallurgy to Design

Speaker: H. R. Neifert

Timken Roller Bearing Co.

"Relationship of Metallurgy to Design" was the title of a talk presented at a meeting of the **Milwaukee Chapter** by H. R. Neifert, supervisor of railway research, Timken Roller Bearing Co.

Mr. Neifert discussed the importance of good design on the fatigue life of a railway wheel and axle assembly. Poor design can offset many of the advantages gained by using higher strength steel. He also discussed the effect of compressive stresses produced in railway axle wheel seats by cold rolling. Thermal stressing, or heating the material to a temperature below the critical point and water quenching, is another method used to produce compressive residual stresses. The value of using full-sized specimens for fatigue testing rather than basing conclusions on results obtained from using small laboratory models was stressed by Mr. Neifert.—**Reported by D. E. Wallschlaeger for Milwaukee.**

M.I.T. Students Receive ASM Scholarships

Morris Cohen (Left), Chairman of the Boston Chapter, Presents an A.S.M. Foundation for Education and Research Scholarship Award to the 1954 Winner, Ronald L. Kintisch, and 1953 Winner, J. A. Moseley. Looking on is W. F. Flannagan, Chapter student counselor. (Reported by M. B. Graham)

Examining Protective Metal Coating Samples

Examining Samples of Protected Metals During a Meeting of the Columbia Basin Chapter Are, From Left: Milton Lewis, General Electric Co.; Bruce W. Gonser, Battelle Memorial Institute, Speaker; and Lewis Reed, Hanford Atomic Products Operation.

Speaker: Bruce W. Gonser

Battelle Memorial Institute

Bruce W. Gonser, technical director, Battelle Memorial Institute, presented a talk on "Protective Metal Coatings" at a meeting of the **Columbia Basin Chapter** held recently.

Dr. Gonser stopped in Richland during his tour of the Northwest to spend a day visiting the laboratory section of the Hanford Atomic Power Operation and to deliver his well-illustrated discussion.

The talk covered the more unusual aspects of resistant metal coatings which are applied to protect the base metal.

Rather than going into detail on such a broad subject as protective metal coatings, Dr. Gonser touched on the high spots of several processes to stimulate audience interest for the ensuing question and answer period. Members of the audience then initiated discussions as to the actual mechanics and uses of the processes in which they were most interested.

The display pieces and samples Dr. Gonser brought along created much discussion and enjoyment, as illustrated by the reptile-like specimen of crystal-bar iodide titanium, complete with yawning mouth and tongue.—**Reported by L. J. Chockie for Columbia Basin Chapter.**

SNT Program for Western Metal Congress Set Up

"Economic Progress Through Nondestructive Testing" will be the theme of all technical sessions programmed by the Society for Nondestructive Testing as part of the Ninth Western Metal Congress to be held in Los Angeles at the Ambassador Hotel, March 28 through April 1.

S.N.T. programs for the five days of the Congress are being developed under the chairmanship of Maurice J. Curtis, head, materials evaluation branch, U. S. Naval Ordnance Test Station, China Lake, Calif. Mr. Curtis was appointed to the chairmanship by Gerold H. Tenney, last year's president of the Society, who also named Robert E. Reynolds, head, nondestructive testing, Lockheed Aircraft Corp., Burbank, as co-chairman.

A total of 25 technical societies are co-sponsoring the Congress and Exposition. Four others in addition to the S.N.T. will present programs at the Congress. These are: American Society for Metals, American Welding Society, American Foundrymen's Society and the Industrial Heating Equipment Association.

Chairman Curtis has announced that the S.N.T. technical program will include papers on the industrial applications of general nondestructive test methods such as eddy current instruments, conductivity measurements, evaluation of precision bearings by magnetic means, high-speed motion picture photography, leak detectors, determination of material thickness and experimental stress analysis. William C. Hitt, national president, in charge of quality control, Douglas Aircraft Co., Santa Monica, will deliver the welcoming address.

Other S.N.T. topics will be radiography, ultrasonics, magnetic particle and penetrant inspection methods. Nearly 30 technical papers will be delivered by authoritative speakers, including the following:

Eddy Current Instruments and Conductivity, by H. N. Staats, Magnaflux Corp.

High-Temperature Brittle Coatings for Experimental Stress Analysis, by Harry J. Jackson, California State Polytechnic College.

New Inspection Tool Measures Embrittlement and Erosion in Aircraft Exhaust Systems, by Justin J. Shapiro, American Instrument Co.

U. S. Attenuation in Metals, by Rohn Truell, Brown University.

Ultrasonic Flaw Plotting Machinery, by C. H. Hastings, Watertown Arsenal and S.N.T. national director.

Ultrasonic Inspection of Jet Engine Compressor and Turbine Wheels, by Don Erdman, Electro-Circuits, Inc.

Training of Radiographers, by William Havercroft, Dept. of Mines and Technical Surveys, Canada.

Modern Fluoroscopic Practices, by W. R. Hampe, X-Ray Sales, Westinghouse Electric Co.

Toning Radiographs, by D. J. Phelan, E. I. du Pont de Nemours.

E. S. Barnhart, Solar Aircraft Co., I. Dagan, Rohr Aircraft Co.; and B. R. Swarts, Convair, will be among other speakers.

Pittsburgh Ladies Tour Westinghouse Electric

The first Ladies Day plant tour of the **Pittsburgh Chapter** consisted of a visit to the East Pittsburgh plant of Westinghouse Electric Corp.'s generator and circuit breaker departments. Members and their ladies were impressed by the size of the equipment and the products manufactured.

A country-style chicken dinner was served at the Jacktown Hotel, east of Pittsburgh, and Westinghouse and A.S.M. officials and their wives were introduced by Gilbert Soler, general chairman. L. A. Kilgore, staff engineering manager, Westinghouse, welcomed the guests and spoke briefly on "Design Stops" and the part the metallurgist has in eliminating these material limitations.

The Westinghouse Quartet sang several pleasing examples of barbershop harmony, including educational ballads such as "The Spaniard That Blighted My Life", and the evening was closed with dinner dancing.—**Reported by J. L. Hamilton for the Pittsburgh Chapter.**

Denver Told of Research's Role In Steel Industry

Speaker: E. S. Davenport
United States Steel Corp.

The **Rocky Mountain Chapter—Denver Group** heard E. S. Davenport, United States Steel Corp., discuss the "Role of Research in Industry" at a recent meeting.

Dr. Davenport presented general aspects of industrial research and its place in our economy. It is estimated that private industry spends about one billion dollars annually on scientific and engineering research and employs upwards of 150,000 persons in this activity. The primary objectives of industrial research and some of the problems involved in planning, managing and carrying out profitable research were discussed, with particular reference to problems of the steel industry. These problems cover the range from raw materials to finished products.

Typical examples of steel industry research projects were described. These projects represent two types of sponsorship: Cooperative projects involving problems of industry-wide interest, sponsored by the General Research Committee of the American Iron and Steel Institute; and projects involving specific products or processes, typical of those that might be carried on by any individual unit in the industry to retain or enhance its competitive position.

Typical cooperative projects include: study of domestic materials, such as tallow, as substitutes for imported palm oil used in the manufacture of hot dipped tin plate and in the cold rolling of sheets and strip; air and stream pollution abatement studies being carried out at several industrial research institutions as well as by individual units in the steel industry in cooperation with state and local authorities; recovery of manganese from openhearth slags as a possible substitute for imported manganese ore.

In the raw materials field much large-scale research has been going on in recent years on the beneficiation of the leaner iron-bearing materials, such as the taconites, and the use of these concentrates in actual blast furnace operations. A better understanding of what takes place within the blast furnace has been brought about by the use of transparent scale models of the furnace, or certain parts of it, which can be studied in the laboratory under various conditions of operation much more effectively and cheaply than a full-size furnace. Likewise, the use of scale models in the study of certain steel-making processes, such as the open-hearth, has been most revealing and may eventually lead to changes in design, or in methods of operation which will result in increased production rates. The use of small experimental coke ovens has been helpful in studying the effect of coal blends and other coking variables on the properties of metallurgical coke.

Mention was made of extensive studies in the field of stainless and heat resisting steels, both with respect to improved properties and the conservation of strategic alloying elements. Likewise, in the field of low alloy, constructional steels, research has led to the development of new compositions with improved properties, particularly adapted to welded structures for use at subatmospheric temperatures. Tests on large, welded pressure vessels made from one of these steels were briefly described.

The speaker also showed a short motion picture film illustrating several typical applications of high-speed and time-lapse motion picture photography to the study of steel industry research problems.—**Reported by H. J. Crin for Rocky Mountain-Denver Group.**

Cites Role of Impurities on Oxidation

Earl Gulbransen (Left), Westinghouse Research Laboratories, Exchanges Comments on His Talk on the "Role of Impurities on the Oxidation of Metals" With A. deS. Brasunas, Technical Chairman of the Oak Ridge Chapter

Speaker: Earl A. Gulbransen
Westinghouse Research Laboratories

The first joint meeting of the **Oak Ridge Chapter** A.S.M. and the East Tennessee Section N.A.C.E. featured a talk by Earl A. Gulbransen, advisory chemist for Westinghouse Research Laboratories, on the "Role of Impurities on Oxidation of Metals".

The various impurities were classified and considered in terms of their effect on the physical and chemical structure of the oxide, oxide-metal interface and metal. The most important impurities from the practical point of view are those concentrated at the metal-oxide interface.

Dr. Gulbransen described various testing techniques which are used in the study of the kinetics of oxidation. These include a study of weight changes, the ASTM life test (cyclic), and a new technique, strain oxidation. Metal specimens are oxidized, strained several percent and re-oxidized. The effect on the oxidation rates is carefully noted. Both an increase and decrease in subsequent corrosion rate have been observed, although a satisfactory explanation is not yet known.

The oxide structures are analyzed by X-ray and electron diffraction, by use of the electronic microscope, and by chemical analysis of the oxide film. No correlation with corrosion resistance is apparent.

During air corrosion, some metal impurities will appear in the bulk oxide, while others will form a separate oxide at either the innermost or the outermost position. The effects of silicon and beryllium on 80 Ni-20 Cr-type alloys and beryllium-bronze, respectively, are illustrations of the two extremes: a beryllium oxide layer forms at the oxide-air interface on beryllium-bronze while a silica or silicate layer forms at the oxide-metal interface on the 80 Ni-20 Cr alloy. These have an important bearing on corrosion behavior.

Dr. Gulbransen spoke briefly on the role of defects and dislocations in the oxidation of metals. During early stages of the reaction, a discontinuous oxide film is formed with the oxide nuclei forming on defects in the metal. The oxidation reaction also can be used to study the substructure of metals which cannot be studied by regular micrographic methods. Thus the embrittlement of pure iron induced by hydrogen treatment at 875° C. can be readily seen in the oxidation pattern.—**Reported by Ted S. Lundy for Oak Ridge Chapter.**

Presents Ultrasonic Inspection Methods

Reporter Robert Fesko of Diamond Chain Co., Inc., Checks His Notes With Edward F. Weller, Research Laboratories, General Motors Corp., Who Spoke on the "ABC's of Ultrasonic Inspection" at a Meeting in Indianapolis. At left is Jim Monagle, Radio Corp. of America, and to Mr. Weller's left is Chairman Wynand W. Brandel, Allison Division, General Motors Corp.

Speaker: Edward F. Weller
General Motors Research Division

The "ABC's of Ultrasonic Inspection" was the topic presented before a meeting of the **Indianapolis Chapter** by Edward F. Weller of the General Motors Research Division. Mr. Weller discussed many aspects of this important innovation to the art of inspection and improved quality control, and used descriptive slides to illustrate his presentation.

Ultrasonic inspection consists of transmitting waves or vibrations through metallic objects to reveal internal flaws and/or discontinuities. Mr. Weller limited his talk to the basic methods of ultrasonic inspection.

The pulse-echo system of ultrasonic inspection determines dimensions and locates defects in steel by the echo principle. The ultrasonic beam or pulse is transmitted through the steel via a quartz crystal. The waves are reflected back, amplified, and a visual image is produced on a cathode ray tube. When a discontinuity is located, the time interval can be readily calculated and the flaw easily located. Mr. Weller pointed out that the surface of the specimen under observation must be smooth in order to provide good contact with the quartz crystal. Oil is added to further improve this contact.

The resonance system of ultrasonic inspection utilizes high-frequency voltage in its operation. The specimen being observed is activated with high-frequency voltage and is put in resonance. The wave lengths developed in the specimen can easily be determined as they are reflected to a cathode ray tube. This system is capable of measuring dimensional characteristics, such as thickness of metallic objects, and the condition of bonds between metals, such as on crankshafts and bearings, can be determined, although this system is used primarily for measuring wall thickness.

The third method of ultrasonic inspection is the transmission method. The part to be inspected, as well as the transmitting equipment, is immersed in a liquid, such as water. In the liquid solution, an output crystal, the part under inspection and a receiving crystal are rigidly mounted. The ultrasonic beam is passed from the transmitting source through the specimen and then through the receiving crystal to a cathode ray tube. Any discontinuity can easily be detected and recognized. This method is proficient in detecting laminations and inclusions in stock and finished parts. Since the parts are immersed in a liquid, a smooth surface is not necessary.

Frequency modulation, the fourth method of ultrasonic inspection, is similar in principle to that of the aircraft altimeter. The frequency modulation system employs a varying ultrasonic signal which is sent into a specimen. A flaw or discontinuity can be detected by a measurement of the reflected waves by means of a cathode ray tube.

Mr. Weller stressed quite strongly that ultrasonic inspection is by no means a cure-all and that no one method of ultrasonic inspection is applicable to all production problems. However, the use of ultrasonics as a method of inspection is economical and a great aid to industry. It prevents long periods of down-time for the inspection of equipment and parts, promotes safer production by locating flaws in equipment, increases savings because of easier inspection, and locates flaws that could not be detected in other ways.—**Reported by Robert Fesko for Indianapolis.**

Gives Pointers on Trouble Shooting in Machine Shop

Speaker: W. H. Splinter
Republic Steel Corp.

W. H. Splinter, machining engineer, Republic Steel Corp., gave a talk entitled, "Machinability and Trouble Shooting in the Machine Shop" at a meeting of the **Terre Haute Chapter**.

He started with a description of factors affecting machinability. His major emphasis, however, was on the fact that many conditions of machinability could only be evaluated in the shop. A steel can have the ideal structure for machinability, as seen by the metallurgist, yet the shop may have trouble. Most troubles with poor machinability result from poor tooling rather than poor metallurgy.

Mr. Splinter suggested that Republic's "Booklet on Machinability" be used as a guide, but pointed out that the data should be frequently tempered with good judgment on specific problems.—**Reported by Karl E. Fenrich for Terre Haute.**

Traces Civilization Through Tools

C. G. Schelly (Left), Wilkie Foundation, Points Out Some Historic Developments in Tools to R. R. Hershey, Timken Steel Division, at a Meeting of Detroit Chapter During Which He Presented His Talk "Civilization Through Tools". Mr. Schelly will present this demonstration before several A.S.M. chapters during this current season. (Reported by R. D. Chapman)

A.W.S. Western Metal Congress Sessions To Stress Aircraft

An all-day session on aircraft and rocketry has been included by the American Welding Society in its four days of technical sessions, which constitute an important part of the approaching Ninth Western Metal Congress, to be held Mar. 28 through Apr. 1 in the Los Angeles Ambassador Hotel, simultaneously with the Ninth Western Metal Exposition in Pan-Pacific Auditorium. Both Exposition and Congress will be presented by American Society for Metals, with cooperation of A.W.S. and 23 other technical societies.

S. R. Lanier, chief engineer, Southwest Welding and Manufacturing Co., chairman of the A.W.S. Los Angeles section, has appointed Hugo W. Hiemke, California Alloy Products Co., program chairman for A.W.S. Congress activities. Richard C. Hayes, process materials engineer, Douglas Aircraft Co., has been named chairman of the aircraft—rocketry sessions.

Mr. Hayes has announced that the following papers will be delivered by the welding society's aircraft and rocketry panel.

"Fusion Weldability of 24ST Aluminum Alloy", by John Bradford Arthur, research welding engineer, North American Aviation Inc.

"Silver Alloy Brazing of Electrical Connections", by Leon Shafin, brazing engineer, Gilfillan Radio Co.

"Resistance Welding of Airframe Structures", by Dennis Samuelson, welding engineer, Solar Aircraft Co.

"Titanium Alloy Fusion Weldability and Correlated Weld Metallurgy", by Charles W. Handova, metallurgist, and Harlan L. Meredith, research welding engineer, North American Aviation, Inc.

"New Full Automatic Weld Tooling for Aircraft and Missile Joinery", by Byron Russell, owner-operator, Airline Welding Co.

"Metallurgical Aspects of Silver Brazing Titanium to Titanium", by N. A. Tiner, metallurgist, North American Aviation, Inc.

As A.W.S.'s Congress sessions will be held mornings and afternoons only, those in attendance will have time to visit the Ninth Western Metal Exposition in Pan-Pacific Auditorium in evenings and the final Friday of the show's run.

The Exposition will contain exhibits of new welding developments evolved in the last year by the aircraft industry.

Roberts at New York Officers Meeting

The National Officers Night Meeting of the New York Chapter Featured a Talk by National President George A. Roberts on "New Developments in High Speed Steels". Pictured are, from left: Walter A. Stadtler, New York Chapter chairman; Dr. Roberts; and James B. Austin, immediate past president A. S. M. (Reported by Donald A. Cardwell for New York Chapter)

Describes Properties of Duplex Materials at Akron Chapter Meeting

Speaker: E. R. Funk

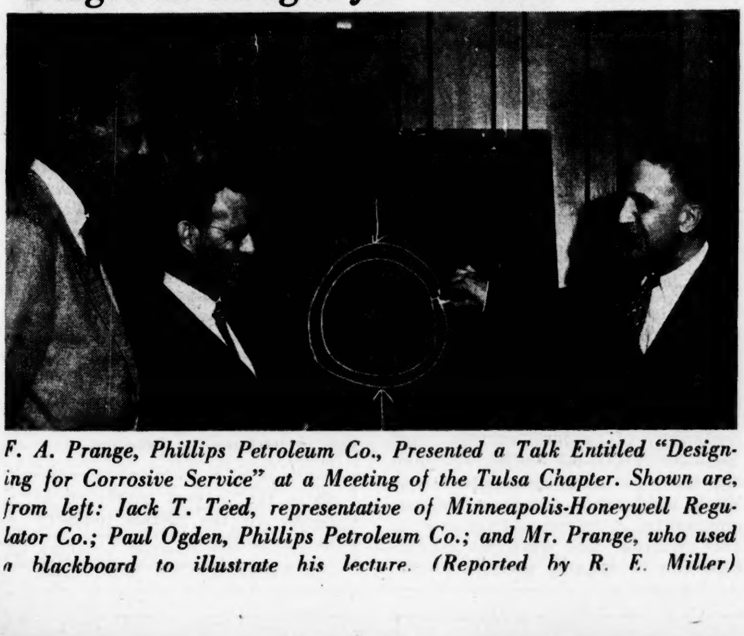
Goodyear Aircraft Corp.

Akron Chapter members heard Edward R. Funk, technical consultant, Goodyear Aircraft Corp., speak on "Elementary Properties of Duplex Materials" at a recent meeting.

Dr. Funk pointed out that a weldment consists primarily of four or five distinct metallurgical zones blended together, with each zone possessing its own metallurgical characteristics. Samples of these regions showed them as joined or lumped together, and the speaker noted that it is from these that the respective properties of the aggregate are determined. The interaction of one region upon another is an important aspect in weld testing, since most tests are performed on a plate exhibiting a welded section.

To consider the interaction problem from a theoretical point of view, the weld was simplified into two regions, the weld and the base metal. Dr. Funk showed why weld metal is more brittle and has a higher yield point than the base metal, and why a transverse tension test weld specimen is not a true test of the ductility of the weld. His opinion is that the longitudinal test specimen is a more discriminatory test for weld metal ductility. He presented actual test data to confirm his statements.—**Reported by Steve Kulchar for Akron Chapter.**

Diagrams Designs for Corrosive Service



F. A. Prange, Phillips Petroleum Co., Presented a Talk Entitled "Designing for Corrosive Service" at a Meeting of the Tulsa Chapter. Shown are, from left: Jack T. Teed, representative of Minneapolis-Honeywell Regulator Co.; Paul Ogden, Phillips Petroleum Co.; and Mr. Prange, who used a blackboard to illustrate his lecture. (Reported by R. E. Miller)

Birmingham Course On ABC's of Iron And Steel Concluded

The **Birmingham Chapter** recently concluded its fall lecture series on the "ABC's of Iron and Steel". Registration totaled 101.

The first lecture of the series was presented by Dan Watkins, general superintendent, blast furnaces and coke ovens, U. S. Pipe and Foundry Co. Mr. Watkins' talk covered the production of pig iron from the raw materials of coal, limestone and iron ore. A brief description of the production of coke from coal was presented. Mr. Watkins set up a characteristic burden for a blast furnace and carried the group through the practical and theoretical aspects of the production of pig iron.

M. D. Neptune, chief metallurgist, National Cast Iron Pipe Co., presented the second talk, "From Pig Iron to Cast Iron". A brief description of the various types of cast iron and cast steels was outlined. Mr. Neptune continued his presentation with some of the aspects of the design of the article to be cast, production of the pattern and cores. Sands used in the various types of molds as well as the actual production of the molds were touched upon during the talk.

Finally, Mr. Neptune described melting and pouring practices used in the foundry.

"From Pig Iron to the Hot Mill" was the subject of the lecture presented by J. W. Cassell, quality control metallurgist, T.C.I. Division, U. S. Steel Corp. A description of the openhearth shop and the functions of the various components contained therein was presented, followed by a description of the charging of the openhearth furnace. Additions to, working and tapping of the metal were outlined. The talk concluded with the description and reasons for using various types of molds in the openhearth shop.

The fourth lecture was presented by Robert H. Madden, assistant manager of metallurgy, inspection and rerearch, T.C.I. Division, U. S. Steel Corp. Since the scope of the processes from the hot mill to the finished product is a large one, Mr. Madden presented two films from U. S. Steel's Making and Shaping of Steel series. Production of rails, wheels, wire, plate, tin plate, galvanized sheets and other products were shown in the movie. Mr. Madden rounded out the program with a few remarks on quality control.

The final lecture was given in conjunction with the regular technical meeting. W. C. Leslie, U. S. Steel Corp. Research Laboratory, presented a talk on the "Alloying Elements in Steel".

The speaker's remarks were confined to considering the effects produced by elements deliberately added to influence the properties of the finished product. Chromium added in varying amounts produces a steel which is highly resistant to many types of corrosion. To improve these stainless steels' mechanical properties, particularly at low temperatures, nickel is added.

In less expensive corrosion resistant carbon steels, copper has been found to be the most potent of all elements which will resist common rusting.

The most effective element for increasing the elevated temperature strength and creep resistance of iron-base alloys is molybdenum, followed by vanadium, tungsten, chromium, titanium, silicon and manganese. Dr. Leslie noted that it is unfortunate that molybdenum contributes nothing to oxidation resistance and that under certain circumstances it may be highly detrimental.

Emphasis was placed on the fact that the mechanical properties of steel are dependent upon microstructure. The presence of alloying elements may improve these mechanical properties in one or more of the following ways:

1. By changing the properties of the ferrite.
2. By changing the distribution of the carbide in the ferrite.
3. By changing the properties of the carbide.
4. By forming finely dispersed oxides, nitrides, sulfides, or other nonmetallic compounds.

The alloying elements in the A.I.S.I. steels control microstructure by retarding the transformation of austenite, i.e., by increasing hardenability, or depth of hardening, and by slowing down the rate of softening during tempering.

The effects of silicon in increasing electrical resistance and magnetic permeability are of great importance to the electrical industry.

In concluding, Dr. Leslie made note of the so-called Hadfield manganese steels which are wear resistant because of their very high rate of work hardening; the more they are pounded, the harder they wear. —**Reported by James B. Templeton for Birmingham Chapter.**

Speaks on Machinability at Tri-City

O. W. McMullan (Left), Bower Roller Bearing Co., Discusses His Talk on "Metallurgical Factors Affecting Machinability" With F. J. Daasch, the Technical Chairman, at a Recent Meeting Held by the Tri-City Chapter

Speaker: O. W. McMullan
Bower Roller Bearing Co.

O. W. McMullan, chief metallurgist, Bower Roller Bearing Co., spoke before the **Tri-City Chapter** on "Metallurgical Factors Affecting Machinability" at a recent meeting.

Mr. McMullan stressed the importance of microstructure and hardness in ferrous metals and their influence on machining operations. While hardness is a measure of machinability, it is not always a suitable criterion, and while microstructure can be reliably used to predict machining qualities, vastly different microstructures are required for different machine operations or grades of material. Screw machine operations, for example, may require one microstructure for best results while gear shaping requires a different one. Cold work can also be used to improve machining. — **Reported by Paul Scherbner for Tri-City.**

Presents Advantages of Vacuum Melting Process At Ottawa Valley Meeting

Speaker: James H. Moore
Vacuum Metals Corp.

James H. Moore, general manager, Vacuum Metals Corp., lecturer at a meeting of the **Ottawa Valley Chapter,** spoke on "Vacuum Metallurgy".

Vacuum metallurgy is still in the development stage and a great deal of work is being carried out by the Vacuum Metals Corp. to determine the full advantages of the process and also to reduce costs by equipment and process research. At the present time, the main applications of the process are in vacuum plating, melting of higher cost alloys, and extractive metallurgy of magnesium, calcium, etc. Many prospective consumers are desirous of obtaining the advantages of the process but as yet the prices are not competitive in their field. The speaker illustrated these advantages with specific cases, such as the great improvement obtained by lowering the cold brittle transition temperature of two chromium irons when vacuum melted.

A brief outline of equipment development was given, starting with the first known attempt in 1890, through the Arsem furnace up to present-day equipment. The induction heating method, refractories used, types of pumps, and pressure measuring system were described as well as the limitations imposed on the process by the physico-chemical properties of the melt and time to reach the desired equilibrium (cost).—**Reported by S. A. Agnew for Ottawa Valley Chapter.**

Describes Metallurgical Problems in Nuclear Reactors

Speaker: John H. Frye, Jr.
Oak Ridge National Laboratory

A talk on "Metallurgical Problems in Nuclear Reactors" was presented by John H. Frye, Jr., director of the metallurgy division, Oak Ridge National Laboratory, at a meeting of the **Saginaw Valley Chapter.**

Dr. Frye discussed the chief economic and technical differences between the use of nuclear power and ordinary fuels, and elaborated on mobile reactors, such as submarine and aircraft reactors, reactors for remote locations where fuel costs are high, and reactors for production of economical electricity.

A movie entitled "Exploration With the High-Temperature Microscope" was shown after the meeting. The film relates the story of the development of the microscope and illustrates many interesting phenomena, including the formation of crystals at temperatures as high as 470° F.—**Reported by A. S. Dryden for Saginaw Valley.**

Talks on Ductile Cast Iron at Boston

Speaker at Boston Chapter Recently Was Howard F. Taylor (Left), Massachusetts Institute of Technology, Who Gave a Talk on "Ductile Cast Iron". Shown at right is Walter M. Saunders, technical chairman of the meeting

Speaker: Howard F. Taylor
Massachusetts Institute of Technology

Howard F. Taylor, professor of mechanical metallurgy, Massachusetts Institute of Technology, presented a lecture on "Ductile Cast Iron at a meeting of the **Boston Chapter.** He traced the history of ductile iron from its discovery in 1948 and described techniques of manufacture and properties attained.

Outstanding features of ductile iron are high fluidity which permits pouring of intricate shapes, and an extremely favorable combination of strength and ductility. Ability of the material to develop a concentrated pipe on solidifying affords the production of sound sections by adjustment of risers. Machinability is comparable to gray iron and the material may be brazed or welded under controlled conditions.

Concerning the magnesium process for making ductile iron, Prof. Taylor indicated that an economical product may be obtained in either a basic or acid-lined cupola using a controlled charge containing less than 0.10% sulphur and no poisoners such as antimony, tin, titanium, copper and others. Additions of cerium as misch metal may be useful to counteract these subversive elements when present. A residual magnesium content in the vicinity of 0.05% is required to assure formation of nodular graphite. Heat treatment provides a variety of properties and microstructures, the most common of which is a fully annealed grade with graphitic nodules in a matrix of 100% ferrite. This type meets a tensile specification of 60,000 psi. with a yield strength of 45,000 psi. and elongation in the range 10 to 18%. Austenitic grades are obtained by alloying.

The above properties combined with reasonable impact strength and ease of processing make ductile iron a useful material which can compete successfully with castings of other metals for many applications. Valves, rolls, engine blocks and press frames are a few examples where ductile iron has achieved economy and commendable performance.

Prof. Taylor described a carbide process recently developed for sulphur reduction of iron involving treatment in the cupola by injection of finely divided calcium carbide with an inert carrier gas like nitrogen or argon. A tensile strength up to 90,000 with 6% elongation has been reported with this treatment. To date, it is necessary to inoculate the iron after carbide treatment for complete spherulization of the graphite; cerium or magnesium is used as the inoculant.—**Reported by M. B. Graham for Boston Chapter.**

Oregon Visits Aluminum Co.

Members of the **Oregon Chapter** visited the fabricating facilities of the Aluminum Co. of America in Vancouver, Wash., during a recent meeting. The feature attraction of the tour was the new extrusion plant, where two 2500-ton hydraulic presses produce a great number of different extruded shapes.

At the dinner given for the visitors in the plant cafeteria prior to the tour, William S. Coleman, extrusion plant superintendent, discussed the importance of this plant in the Pacific Northwest and described the equipment and processes the members would see as they were conducted by guides through the production operations.—**Reported by James Bates for Oregon Chapter.**

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Aluminum Plant — American Metal Processing Co. has been organized in Wakefield, Mass., under management of A. E. Durkin, formerly of General Electric Co. The new company specializes in anodizing of aluminum and other chemical processing of aluminum, magnesium and steel.

Mass Production Technique—A new mass production technique now allows Visual Production Planning, Inc., to produce plastic scale models of machine tools and other plant equipment at costs reduced by as much as two-thirds. The method is substantially less expensive than using paper and film templates, and offers the added advantage of the third dimension.

Corrosion Course—Fundamentals of Pipe Line Corrosion will be the subject of a two-day short course to be conducted by the Houston Section, National Association of Corrosion Engineers, Jan. 20-21, 1955. The course is planned for foremen, superintendents, field personnel and beginning corrosion engineers, and will be held at the University of Houston, Texas.

Silver Brazing Alloys—Air Reduction Sales Co. has announced its new Aircosil products, a complete line of silver brazing alloys and flux for all types of production jobs. Aircosil alloys are available as rod, wire, sheet, rings and gaskets, as well as special shapes. The silver brazing flux is in paste form and will not freeze, crystallize or separate and the residue rinses off easily in hot water.

Changes Name—Enthone, Inc., manufacturers of chemical products for metal finishing, has announced a change in the name of its division formerly known as Connecticut Metalcraft, Inc. The new name will be Comco, Inc. The plant is located in New Haven, Conn.

Expansion—Completion of processing facilities at their Newfield, N. J., plant for full-scale production of special alloys, processed minerals and ferro alloy powders has been announced by Shieldalloy Corp. The expansion offers an additional source of supply of specialized materials for welding rod manufacturers, steel, ceramic and chemical industries.

Electrode Specifications—New tentative specifications, issued jointly by the A.S.T.M. and A.W.S., cover electrodes for welding nickel and nickel-base alloys individually to themselves and also for welding these materials to steel. Included are filler metals for welding the clad side of nickel-base alloy clad steels.

Bristol Builds—Construction work is nearing completion on expansion of the manufacturing plant of the Bristol Co., Waterbury, Conn. Heat treating facilities have also been increased to process a much larger volume of instrument parts and socket screws.

Quantometer — Applied Research Laboratories, Glendale, Calif., has announced a simplified production control quantometer, a modification of their regular quantometer, for those firms which have need for regular, but limited, spectrochemical analysis, or those wishing to start minimum laboratories and expand them later as needed.

Short Course—A three-day course in Corrosion is scheduled to be held Feb. 2-4, 1955, at the University of Toronto. The university extension service is sponsoring the course with the cooperation of the National Association of Corrosion Engineers. Topics will include fundamentals, factors influencing corrosion rate, bituminous coatings, corrosion resistant alloys, diagnosis of corrosion problems, inhibitors and use of various electrical instruments in corrosion control.

Molybdenum Price Raised—Climax Molybdenum Co. has announced an increase in the price of its basic product, molybdic oxide, of about 10%, and other refined products proportionately, the first price increase in four years.

Gas Furnace—A gas-fired vertical radiant tube hydraulic pusher production carbonitriding and gas carburizing furnace is being offered by Lindberg Engineering Co., Chicago. The furnace was designed to handle production loads of small parts requiring neutral hardening, carbonitriding, heavy and medium case gas carburizing as well as carbon restoration.

Precision Bearings—Wider availability and possibly lower costs of precision bearings manufactured in the U. S. can be anticipated as a result of the introduction here of a Swiss machine which automatically gages and classifies rollers and balls for bearings in diameter groups with increments of 0.00002 in., with maximum possible error of 1/10 micron. The machine, called the Censor, is fully automatic.

Instrumentation Conference — The fifth annual Instrumentation in the Iron and Steel Industry Conference, sponsored by the Instrument Society of America, will be held in Pittsburgh, from March 8 to 10, 1955, at the Hotel William Penn. The conference will include four scheduled technical sessions dealing with control and instrumentation problems in the industry, and will feature over 50 exhibits of instruments and controls.

A.I.E.E. Meeting—The winter general meeting of the American Institute of Electrical Engineers will be held at Hotel Statler and Hotel Governor Clinton, New York City, from Jan. 31 through Feb. 4, 1955. A full technical program and a series of plant visits have been arranged. Information may be obtained by writing A.I.E.E., 33 West 39th St., New York 18, N. Y.

Pilot Controller — A thermostatic pilot controller, unusually small in size and rugged in construction, has been developed by Fulton Sylphon Division of Robertshaw-Fulton Controls Co. The controller provides accurate temperature control of liquids or air when used in conjunction with valves, dampers or other controls. It is readily employed in control systems of electroplating tanks, dyeing and bleaching machinery, chemical vats and processes and other applications in which rapid response and adjustable control are necessary.

Mechanical Filter—A constant flow of air, free of dust and water droplets for longer periods of operation, is promised by a new mechanical filter offered by Porous Plastic Filter Co. The heart of this improved filter is a permanent core or "cartridge" of Teflon felt which is both chemically inert and water repellent.

Illustrates Grinding and Machining of Titanium At Louisville Meeting

Speaker: E. J. Krabacher
Cincinnati Milling Machine Co.

The **Louisville Chapter** was host to the local chapter of the American Society of Tool Engineers at a recent meeting. The speaker, E. J. Krabacher, senior research engineer in charge of applied research on metal cutting and grinding, Cincinnati Milling Machine Co., discussed the "Machining and Grinding of Titanium".

At the usual machining speeds, a better surface finish is producible on titanium than on steel and, even though titanium is stronger, the forces and power consumption required is less. Tool life, however, is considerably shorter and there is a marked difference in the chip produced. Also, grinding of the wheel loads very rapidly often results in excessive wheel wear. High-speed movies of SAE 1020 and SAE 1112 steel and titanium being machined under the same conditions as a means of comparison and taken through a microscope at 7500 frames per second were shown. The movie was used to illustrate the talk along with slides of photomicrographs and macrographs and charts plotting cutting speed versus cutting force, shear angle, shear energy, friction force, friction energy and chip-tool interface temperature.

The low values of tool forces and power consumption are due to a higher shear angle than experienced with steel. Short tool life and high grinding wheel wear, however, is caused by the high mutual solubility of titanium in most other metals and refractories at elevated temperatures. Tool and wheel life can, therefore, be controlled by regulating the temperature at the tool or wheel interface by reducing the cutting or wheel speeds and the use of effective cutting fluids.—**Reported by F. F. Dietsch for Louisville.**

Advantages of Automation Theme at Buffalo Meeting

Speaker: Herbert A. Franke
Ford Motor Co.

Automation of fabricating plants has brought to the American market a great variety of high-quality products at prices which assure a high consumption. Using manufacturing methods of only a few years ago, costs would have been so high that no one could afford to use them. Thus, automation deserve much credit for the wealth which Americans enjoy today.

Herbert A. Franke, manager of automation, Buffalo Stamping Plant, Ford Motor Co., spoke at a meeting of the **Buffalo Chapter** on the "Principles of Automation" and how automation is used in Ford's Buffalo Stamping Plant to make it one of the most advanced plants of its kind in American industry. In operation only five years, this plant is constantly adding to its automation to increase productive capacity and improve working conditions.

The idea of automatic manufacturing methods is not new. Henry Ford probably made the first important use of it when he established the automobile chassis assembly line. Since then, automation has been extended to virtually all subassembly fabrication in the automobile industry. Safety for workers has not only been improved by automation, but a demand has been created for more highly skilled technicians and engineers to maintain equipment and develop new devices.

Mr. Franke emphasized that cooperation between tool designers, engineers and other groups is absolutely necessary in developing automation. Costly shut downs are the result of overlooked problems. Once the equipment is installed and operating, preventive maintenance becomes the most important factor. Elaborate lubrication schedules are kept and all replaceable parts, such as jaw assemblies, link chains, etc., are changed at regular intervals.—**Reported by A. E. Leach for the Buffalo Chapter.**

Illustrates Metal Flow in West Ontario

Checking the Exhibit Used by J. W. Lengbridge to Illustrate His Talk on "Metal Flow in Deep Drawing Aluminum" Before the Western Ontario Chapter Are, Front Row, From Left: J. W. Pawley, Technical Chairman; F. Miller, Chapter Vice-Chairman; and Mr. Lengbridge; and Back Row, From Left: T. Maloney, Representing Clevite Ltd., Sustaining Member; and H. J. Hugh, Representing Eureka Foundry and Mfg. Co., Sustaining Member

Speaker: J. W. Lengbridge
Aluminum Goods Ltd.

Members of the **Western Ontario Chapter** heard J. W. Lengbridge, project engineer, Aluminum Goods Ltd., present a talk entitled "Metal Flow in Deep Drawing Aluminum" at a recent meeting.

Mr. Lengbridge showed metal sheets before drawing, on which he had scribed lines approximately ¼ in. apart, with alternate spaces painted black. On other pieces he had scribed a checker board design with ¼-in. squares, also painted alternately.

He then showed a deep drawn part which had had exactly the same lines scribed on it before drawing. After drawing it showed the flow of the metal in the various parts of the finished piece.

Mr. Lengbridge illustrated his lecture with a moving picture and colored slides.—**Reported by J. W. Pawley for Western Ontario.**

Gives Pointers on Selection of Steels

Shown at a Joint Meeting of the Springfield Chapters A.S.M. and A.S.T.E. Are, From Left: Karl Kuralt, Treasurer A.S.T.E.; L. Brewster Howard, Vice-Chairman A.S.M.; Carl Floe, Speaker; Hollis Moore, Vice-Chairman A.S.T.E.; Ridgway A. Cooke, Chairman A.S.M.; Robert Marquiss, Secretary A.S.T.E.; and Henry P. Langston, Technical Chairman of the Meeting

Speaker: Carl F. Floe

Massachusetts Institute of Technology

Carl F. Floe, professor of metallurgy, Massachusetts Institute of Technology and consulting metallurgist, addressed a joint meeting of the **Springfield Chapters** A.S.M. and A.S.T.E. on "Selection of Steels".

Dr. Floe discussed typical kinds of metal failures and pointed out that 80% of all failures are caused by fatigue. The fatigue crack starts as a result of localized tensile overloading at imperfections on or near the surface caused by scratches, forging laps, corrosion pits or faulty design. In some cases a properly designed piece may be abused during processing or assembly, such as by failure to machine fillets to specifications or over or under tightening of bolts. Dr. Floe also emphasized the need to avoid residual tensile stresses in the surface of components subjected to fatigue loading.

Other important causes for failure are plastic deformation or fracture as a result of a single cycle of overloading, wear, corrosion and corrosion fatigue.

Of the three kinds of steel—cold-drawn; low carbon, low alloy high-strength structural steels; and steels containing 0.3 to 0.6% carbon and intended for quenching and tempering—the latter group, which includes the SAE-AISI steels, is considered of primary interest.

The properties of the SAE-AISI alloy steels depend upon the quantity and quality of the carbide dispersion in ferrite. The best properties are obtained from a uniform distribution of fine, rounded particles of carbide in ferrite. This structure is best obtained by quenching and tempering. Quenching forms a supersaturated solution of carbon in iron which is decomposed upon tempering to carbide particles and ferrite. By control of tempering time and temperature the size of the carbide particles and the properties can be controlled. Alloys exert their greatest effect in respect to ease of hardening (i.e., they primarily control the ease with which a supersaturated solution [martensite] can be formed).

A basic consideration in the actual selection of steel is cost. This is related not only to the initial cost of the steel but also the cost of processing it, the degree of standardization desired and the equipment available for processing.

Another important basis for selection is the hardenability necessary (i.e., is water or oil-hardening steel needed?). The type of steel selected and the heat treatment to which subjected will affect distortion and in turn, finishing cost, quench-cracking tendencies, and the residual stress pattern in the finished object. The relationship between differential cooling rates and transformation rates, as produced during quenching, is responsible for quench cracks and residual stresses. Tempering usually tends to reduce residual stresses, and it is desirable to select steels which resist softening during tempering so that residual stress removal can be achieved without undue loss of hardness and strength.

Dr. Floe pointed out that hardenability has been somewhat oversold. He illustrated this by describing the stress distribution in a bar subjected only to bending and torsional loads. Since the fibers carry a smaller and smaller proportion of the load as the center of the bar is approached, there is no point in having through-hardening in bars subjected to these kinds of loads. Excessive hardenability may result in quench crack tendencies as well as residual tensile surface stresses.

As to the effects of specific alloying elements, molybdenum is added to decrease temper brittleness, nickel improves low-temperature properties and manganese tends to promote retention of austenite. All alloying elements improve hardenability. Nickel, chromium and molybdenum in combination are particularly effective in this respect.

If the steel is to resist wear, two possible choices are indicated: Use a high carbon steel tempered at low temperatures as these steels tend to have residual tensile stresses; and a surface hardened steel can be considered, such as a nitrided steel. The nitriding process requires alloy steels, is a slow process, and is inherently expensive. Carburizing or carbonitriding are more popular surface hardening methods which are less expensive. All three methods of surface hardening produce a favorable residual stress pattern if properly carried out.—**Reported by C. A. Keyser for Springfield.**

Concept of Machinability Of Metals Given at Akron

Speaker: F. W. Boulger

Battelle Memorial Institute

F. W. Boulger, metallurgist in charge of Battelle Memorial Institute's ferrous metallurgy division, addressed the **Akron Chapter** on the subject of "Metallurgical Aspects of Machinability".

Using slides, Mr. Boulger illustrated the different concepts of machinability with relative machining processes. He recorded his data from the use of lathe tests. The lathe, which had been used for this research study, was rigged to act as a constant pressure lathe. The statistical study of the test results made by this application revealed that a close correlation agreed with those obtained by the conventional laboratory tool life test and commercial machining tests.

The speaker emphasized that when measuring machinability one must depend on the work piece and environment. One cannot use hardness value as a complete indication of machinability rating. Microstructure plays a major role in establishing machinability rating. However, most of all, the measurement of machinability is dependent upon the amount of heat which is liberated between chip and work piece. The heat should be in the chip. A high feed at lower speeds will give the tool its lowest heat and, by the same token, the longest life.

Mr. Boulger concluded his talk by re-emphasizing the importance of knowing the work piece and its environments so as to properly associate it with its own machinability characteristics.—**Reported by Steve Kulchar for Akron.**

Describes Alloys for Electron Uses

Rhode Island Chapter Members Heard a Talk on "Expansion and Magnetic Alloys in the Electrical and Electronic Fields" by Warren Eberly, metallurgist, Carpenter Steel Co. Mr. Eberly covered the groups of alloys developed to meet requirements of engineers responsible for efficient operation of electrical and electronic equipment. Pictured are, from left: Kenneth Mairs, University of Rhode Island; Mr. Eberly; and H. D. Nelson, vice-chairman. (Reported by T. R. Sergeant for Rhode Island)

Engineer's Responsibilities Evaluated at Cleveland

Speaker: J. H. Friedman
National Machinery Co.

"The Engineer's Responsibility" was the subject of a talk given by J. H. Friedman, president and general manager, National Machinery Co., before Sustaining Members Night meeting of the **Cleveland Chapter.**

Mr. Friedman emphasized that engineers have responsibilities in human relations as well as in technical matters. Because almost all successful engineering efforts today are team efforts, the engineer who can work with and for people assures his own success. In order to develop teamwork and cooperation on the engineering staff so that management can obtain the full benefit of their talents and skills, engineers should be properly assigned to jobs which they are capable of handling efficiently. Too often technicians are set to creative work and "idea" men to detail work. Both are wasteful.

The engineer bears the responsibility of unquestionable loyalty and honesty to his company, his associates and himself. He must learn to respect the workman's dignity. He must show tolerance, sympathy and consideration in his dealings with others. Whatever his level of employment, he should start from the first day he reports to work to *earn* the loyalty and cooperation of his co-workers. He should promote a man for his good qualities rather than hold him back for his mistakes. If a man doesn't measure up, he should be told, not ignored. Either help him to fix the problem or help him to relocate to advantage.

The worker should be allowed to determine for himself when to retire. Retirement is a function of mind and body, not age. For many, to retire is to die, and you should recognize their dignity rather than compelling them to quit work.

To justify management's faith in him and to assure his own success, the engineer should be aggressive. He must sell his ideas and himself to management. Progress made through engineering efforts and research reaps profits for management and for the engineer.—**Reported by Robert H. Stoiber for Cleveland.**

Outlines Advantages of Metal Surface Cleanliness

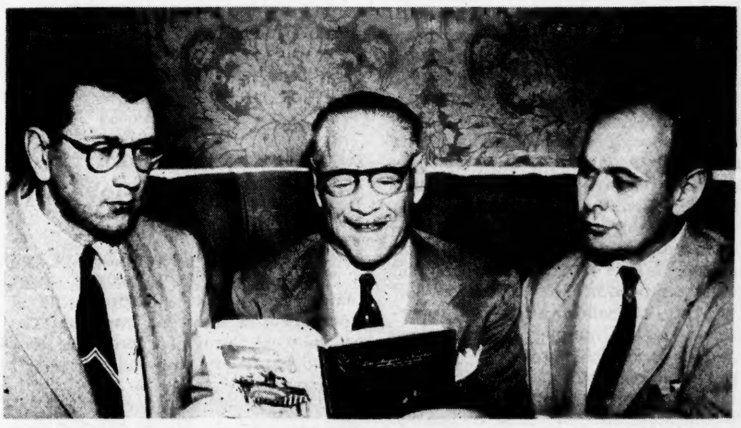
Speaker: J. H. Shoemaker
Kolene Corp.

Stereoscopic color slides were used by J. H. Shoemaker, president, Kolene Corp., to illustrate his talk on "Surface Cleanliness of Ferrous Materials for Further Processing", given before the **Rockford Chapter.** This new type of visual aid made it possible for the audience to look deep into the cores of castings before and after cleaning.

Mr. Shoemaker outlined the history of molten salt bath cleaning from its first use as a process to clean cast iron in order to permit the use of lead base babbitt in place of tin babbitts, to its latest development as a treatment for continuous descaling of stainless steel strip and titanium.

The speaker illustrated some of the design and processing advantages offered by complete removal of foundry sands and scale, including the attainment of better machinability, lower temperature metal joining, increased cooling properties of cylinder blocks and more adherent plating.—**Reported by Quentin C. Bowen for Rockford.**

Committee Plans Western Metal Show



Los Angeles Chapter Committee Appointments for the Ninth Western Metal Congress and Exposition Are Discussed With National Secretary W. H. Eisenman (Center), by S. R. Kallenbaugh (Left), Chapter Chairman, and Jonmore Dickason, Secretary. The Exposition will be held in Los Angeles' Pan-Pacific Auditorium and the Congress at the Ambassador Hotel in Los Angeles. Mr. Kallenbaugh is district manager, Timken Roller Bearing Co., Mr. Dickason is general manager, Metal Control Laboratories, Inc.

Explains Nucleation Theory at Oak Ridge

David Turnbull (Right), General Electric Research Laboratory, Presented a Talk on "Formation of Crystal Nuclei in Liquid Metals" at an Oak Ridge Chapter Meeting. He is shown with E. E. Stansbury, technical chairman

Speaker: David Turnbull
General Electric Research

The **Oak Ridge Chapter** began its fall series of lectures with a talk by David Turnbull of General Electric Research Laboratory. He discussed the "Formation of Crystal Nuclei in Liquid Metals".

To introduce his subject, Dr. Turnbull reviewed previous work, stating that since the time of Fahrenheit, who noticed that solidification may begin at various subcritical temperatures, very little progress was made on the development of the nucleation mechanism in solidification until a few years ago. He pointed out that some metals will show extensive undercooling while other metals show little or no undercooling. It has been found that in small droplets, metals undercool quite consistently, approximately 1/5 of the absolute melting point temperature. It is known that the rate of solidification is proportional to the number of nucleation centers and their rate of growth. The undercooling strongly depends upon the specific nature, particularly the structure, of these nucleation centers.

Various laboratories have been studying the effectiveness of various controlled impurities in the form of small particles as nucleation centers. These experiments indicate that the as-cast grain size can often be refined and the properties improved by the addition of nucleation additives. Some of the factors that determine the effectiveness of particles as nucleation additives are their stability, the degree of their dispersion in the melt and their crystallographic relationship with the metal structure. It may also be stated that somewhat similar considerations apply in rainmaking.

Dr. Turnbull also spoke on the "Nucleation Theory" at a graduate seminar of the University of Tennessee's metallurgy division under the auspices of the Oak Ridge Chapter.—**Reported by G. W. Cunningham for Oak Ridge Chapter.**

Rome Chapter Members Visit Various Divisions Of Utica Drop Forge

Members of the **Rome Chapter** had a choice of a visit to one of three plants of the Utica Drop Forge & Tool Corp. at a recent meeting. The tours were provided with factory escort guides and included the following divisions.

New York Mills Plant, where 100, 300 and 1000-lb. charge vacuum furnaces were in operation. Extensive physical test, spectrophotometer, metallurgical and chemical departments for research and quality control were included in this tour.

Whitestown Plant, where forging procedures and inspection of jet engine blades were demonstrated and discussed.

Clayville Plant, where precision machining of forged material was in progress. Emphasis was placed on highest quality of finished product to meet the varying specification requirements.

Following a dinner meeting, the following speakers, representing the host company, presented interesting background information on their company and its products.

T. Hughes, sales manager, speaking for the company president, outlined the importance of the metallurgical department in the conduct of a business such as the Utica Drop Forge & Tool Corp., which has a long history of making excellent tools and has now embarked on a program of contracting to furnish jet engine parts.

Falih N. Darmara, vice-president and manager of metals division, discussed "Vacuum Melting Operations". Dr. Darmara briefly outlined the advantages of vacuum melting and casting of special alloys used in jet engine parts. The lack of alloy materials suitable for such exacting requirements has led Utica to the decision to do its own melting and casting. Extensive quality control tests are used repeatedly to assure highest quality.

William A. Barnes, vice-president, chief engineering tool division, discussed "New Tools Developed". After reviewing the history of the Utica tools, Mr. Barnes discussed the cold junction welding tools made by his company under license agreement. Copper-to-copper, aluminum-to-aluminum and copper-to-aluminum welds were demonstrated. The hand-operated tool for making these welds, as well as the Utica-made tool for making solderless wrapped wire connections in accordance with the Bell Telephone method, were discussed and demonstrated.—**Reported by John M. Thompson for Rome Chapter.**

VPI Students Hear Talk on Aluminum

Speaker: Robert E. Jordan
Poly-Scientific Corp.

The **Virginia Polytechnic Institute Chapter** heard an interesting talk on "Aluminum" given by Robert E. Jordan, Poly-Scientific Corp., at a recent meeting held at the college.

Mr. Jordan pointed out the relationship between fundamental and practical knowledge in metallurgy, the scientific method of reduction of aluminum and alloying and working aluminum.—**Reported by B. C. Boesser for V.P.I. Chapter.**

Meet Your Chapter Chairman

J. R. Kattus

F. H. Beck

M. F. Howard

MISSOURI SCHOOL OF MINES AND METALLURGY

KEN PONCIROLI is a senior at Missouri School of Mines, majoring in nonferrous process metallurgy. He was born in St. Louis and attended St. Louis schools, including Roosevelt High School. He has received two scholarships in his course of studies at M.S.M.: the Curators Scholarship and the Kennecott Copper Co. scholarship.

Ken is quite active in various clubs and organizations on the M.S.M. campus. The Engineers Club claims him as business manager, he is vice-chairman of the school chapter of the American Foundrymen's Society, is on the Board of Governors of the Independents Club, outer guard of the Blue Key Honor Fraternity, and belongs to Alpha Phi Omega and Theta Tau fraternities.

Besides his many extracurricular activities, Ken enjoys hunting and fishing, loves to tinker in a workshop and collects modern jazz records.

ROCKY MOUNTAIN-DENVER

S. MARK DAVIDSON, chairman of the Denver Section of the Rocky Mountain Chapter, is chief engineer at the Thompson Pipe & Steel Co. He was born in Fort Morgan, Colo., and received his primary education there. He received a B.S. degree in electrical engineering from University of Colorado in 1935, where he was intramural boxing champion in 1933-34.

His first jobs were with pick and shovel and on pipe line installation for Thompson Pipe & Steel.

Mark is married and has one daughter. He is a member of the American Society of Civil Engineers, Colorado Society of Engineers, Denver Chamber of Commerce, and the Colorado Section of the Irrigation and Drainage Division, A.S.C.E., of which he is president. He is an amateur gunsmith and likes to hunt and fish, and claims fame as a one-shot deer and antelope hunter.

COLUMBUS

FRANKLIN H. BECK, research assistant professor, Ohio State University Experiment Station and assistant director of the Station's corrosion research laboratory since 1949, received his B.S. degree in metallurgical engineering from Pennsylvania State University in 1943. From graduation to 1946 he was with the DuPont Co.'s experimental station in Wilmington, and Grasselli Laboratory in Cleveland, and the Manhattan Project in Richland, Wash. He enrolled in the graduate school at O.S.U. in 1946 and received his M.S. and Ph.D. degrees in 1947 and 1949 respectively.

Prof. Beck has been working in the field of corrosion over the past eight years and during this time he has published a number of papers on this subject. He served as treasurer and vice-chairman of Columbus Chapter during the past two years, and is presently chairman of the educational lectures for N.A.C.E.

THE CAROLINAS

JAMES R. HUNTLEY was graduated from North Carolina State College with a B.S. degree in metallurgical engineering in 1941. He was employed by Grumman Aircraft Corp. in Bethpage, L. I., for six years as a tool engineer, then migrated back South to establish the Tool Service Engineering Corp., an engineering and contracting service.

Jim is presently manager of the Monroe Rotary Club, chairman of the Educational Committee of the Piedmont Section of A.S.T.E., and an active member of the Central Methodist Church. He is married and has four children, and enjoys a good golf game as frequently as possible.

BIRMINGHAM

J. R. (Bob) KATTUS, a graduate of University of Cincinnati and Purdue, was born in Cincinnati, Ohio. His first job was as an officer in the U.S.N.R. stationed in the metallurgical division of the Naval Research Laboratory in Washington, and he was subsequently metallurgist and chief metallurgist in two nonferrous foundries. He is presently senior metallurgist at the Southern Research Institute.

Bob is married and has two girls and one boy. He is a member of the American Foundrymen's Society and the National Association of Corrosion Engineers. He served for three years in the naval reserve and is a golfer and a bridge player in his spare time.

ROME

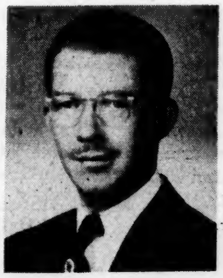
MAX F. HOWARD, assistant metallurgist for Oneida Ltd., was born in Pierrepont, St. Lawrence County, N. Y., and is a graduate of St. Lawrence University, where he received his B.S. degree in 1931. He played football and was on the track team at college. He has had jobs in selling and teaching science subjects at New York State High School.

Max has one boy. He has held various offices with N. Y. Troop 32 in the Boy Scouts of America, and also belongs to Rotary and Kiwanis. He likes to hunt partridge, play golf and bowl and does some amateur farming.

K. Ponciroli

J. R. Huntley

S. M. Davidson



Talks on Machining

The Columbia Basin Chapter recently heard a talk entitled "Machining" by Anthony R. Konecny of the University of Washington engineering faculty. Thirty-five members and nine guests enjoyed this informative lecture.—**Reported by Paul D. Wright for Columbia Basin.**

Tatnall Speaks at York

Speaker: F. G. Tatnall

Baldwin-Lima-Hamilton Corp.

Francis G. Tatnall, manager of testing research for Baldwin-Lima-Hamilton Corp., presented a talk entitled "Relation of Engineering and Metallurgy" at a meeting of the **York Chapter.** Since this talk has been given before a number of A.S.M. Chapters, it will not be reviewed. **Reported by L. A. Hurvitz for York Chapter.**

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Jan. 29	Brookside Country Club	Social	Annual Dance
Baltimore	Feb. 21	Engineers Club	H. M. Goldman	Surface Preparation, Chemical Cleaning and Metal Finishing
Birmingham	Feb. 1	Homewood Elks Lodge	Social	Ladies Night
Boston	Feb. 4	M.I.T. Faculty Club	George Roberts	Advances in Toolsteel Technology
Buffalo	Feb. 4	Hotel Sheraton	Social	Annual Dance
Calumet	Feb. 8	Phil Smidt's		F. B. I.
Carolinas	Feb. 17	Winston-Salem	I. V. Williams	Metals Engineering for Communcation Equipment
Cedar Rapids	Feb. 8	Hotel Roosevelt	A. J. Langhammer	Heavy Duty Self Lubricating Bearings and Powder Metal Parts
Chicago	Feb. 14	Furniture Club	R. L. Mattson	Residual Stresses
Cincinnati	Feb. 10	Eng. Soc. Hqdtrs.	D. Swan	New Welding Developments
Cleveland	Feb. 7	Hotel Hollenden	John Davis	Canada's Mineral Industries
Dayton	Feb. 9	Engineers Club	G. E. Linnert	Welding Metallurgy of Steel
Detroit	Feb. 14	Engineering Society	George Roberts	Powder Metallurgy of Alloy Steels
Eastern New York	Feb. 1	Panetta's	C. G. Schelley	Civilization Trough Tools
Indianapolis	Feb. 21	McClarney's Restaurant	Dave Edgerton	Heat Treating Hints
Jacksonville	Feb. 14	Seminole Hotel	H. C. Knerr	How the Metallurgist Can Aid Industry
Kansas City	Feb. 16	Milleman's Restaurant	J. B. Russell	Aluminized Steel
Lehigh Valley	Feb. 4	Hotel Traylor	E. F. Nippies	Importance of Temperature Measurement in Welding
Los Angeles	Feb. 24	Rodger Young Auditorium	N. L. Mochel	Power and Materials—Now and in the Future
Louisville	Feb. 1	Kapfhammer's Party House	C. T. Haller	Nodular Iron
Mahoning Valley	Feb. 12	V. F. W.	Social	Valentine Party
Milwaukee	Feb. 15	City Club	H. E. Boyer	Application of Newer Metallurgical Knowledge to Heat Treatment of Steel
Montreal	Feb. 7	Queen's Hotel		President's Night
Muncie	Feb. 8	New Castle	Richard Chapman	Predicting Tempered Hardnesses
New Haven	Feb. 17	Hotel Elton	L. S. Foster	Applications of Radioactive Tracers
New Jersey	Feb. 21	Essex House	N. J. Grant	High-Temperature Metallurgy
New York	Feb. 18	Hotel St. George	Social	Annual Smoker
Northeast Pennsylvania	Feb. 10	Irem Temple Country Club	R. L. Wilson	High Carbon Steels in Engineering Applications
Northwestern Pennsylvania	Feb. 24	Meadville	T. W. Lippert	Applications and Metallurgy of Titanium and Its Alloys
North Texas	Feb. 3	Sky Chef Restaurant	Al Zeitlin	
Notre Dame	Feb. 9	Engineering Bldg.	James H. Moore	Vacuum Techniques in Metallurgy
Oak Ridge	Feb. 16	ORINS Auditorium	Don Erdman	Supersonic Testing
Ontario	Feb. 4	Royal York Hotel	E. A. Lancaster	New Uses of Tin
Ottawa Valley	Feb. 8	Lansdowne Park	Social	Ladies Night
Philadelphia	Feb. 25	Engineers Club	A. O. Schaefer	Business of Making Forgings
Jr. Section	Feb. 14	Standard Pressed Steel Co.		Plant Visit
Pittsburgh	Feb. 10	Fort Pitt Hotel	Panel	New Methods of Melting
Purdue	Feb. 15	Purdue Memorial Union	J. Gurski	Metals in the Automotive Industry
Rhode Island	Feb. 2	Eng. Soc. Bldg.	Arthur Matheson	Reactor Materials in the Atomic Power Age
Rochester	Feb. 14	Chamber of Commerce	J. B. Austin	Magnification in Time
Rocky Mountain	Feb. 10	Oxford Hotel	N. Mochel	Metallurgy and Turbine Development
Rome	Feb. 7	Elks Club	D. W. White	Metallurgy for Nuclear Reactors
St. Louis	Feb. 18	Forest Park Hotel	Roger Sutton	Atomic Energy and Metallurgy
Saginaw Valley	Feb. 15	Frankenmuth Hotel	Parker Frisselle	What Precedes Marketing a New Product?
San Diego	Feb. 17	Solar Aircraft Auditorium	R. H. Sparling	New Developments in Powder Metallurgy
Savannah River	Feb. 26	Bon Air Hotel	Social	Engineers Week—Dinner Dance
Springfield	Feb. 21	University of Massachusetts	G. H. Hupman	Development Engineering
Texas	Feb. 1		H. M. Banta	Metallurgical Problems in Deep Well Drilling
Tri-City	Feb. 1	Rock Island Arsenal	T. J. Dolan	Functions of Experimental Stress Analysis
Washington	Feb. 14	Naylor's Restaurant	Jerome Strauss	Burgess Memorial Lecture
Western Ontario	Feb. 11	Cobblestone Inn		Bronze for Dies
Wichita	Feb. 15	K of C Hall		
Worcester	Feb. 9	Hickory House	E. E. Oathout	Coated Abrasives and Their Use in Metal Industries
York	Feb. 9	York	H. S. Avery	

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A General Metallurgical

1-A. Handling Methods for Metals. Stanley S. Greene. *Flow,* v. 10, Nov. 1954, p. 75 + 19 pages.
Handling, storing and positioning metal shapes; copper and brass warehouses. Photographs.
(A5, ST, Cu)

2-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 21, Oct. 1954, p. 477-484.
Covers "notch brittleness" to "oriental amethyst". (To be continued.)
(A10)

3-A. Re-Melt Shell Casing Scrap. E. D. Boyle. *American Foundryman,* v. 26, Nov. 1954, p. 44-47.
Equipment and techniques. Photographs, diagram. (A8, CN)

4-A. Ion Exchange Materials in the Metallurgical Industries. T. R. E. Kressman. *Institute of Metal Finishing, Bulletin,* v. 4, Autumn 1954, p. 219-226.
Water softening and demineralization; recovery of metals from waste liquors and rinse waters. 5 ref. (A8)

5-A. Jones & Laughlin Pittsburgh Works. T. J. Ess. *Iron and Steel Engineer,* v. 31, Nov. 1954, p. 76-102 + 6 plates.
Equipment, plant layout and operations from ore, coal and limestone to finished products. Photographs, map, tables, drawings.
(A5, D general)

6-A. The Iron and Steel Industry of Finland. Charles F. Goodeve. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 219-222.
Capacities, facilities and technical developments. 7 ref. (A general, ST)

7-A. The Recovery of Zinc From Dross. A. G. Thomson. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 159-160.
Basic principles and economic aspects. (A8, A4, Zn)

8-A. The British Iron and Steel Research Association. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 176-180.
Survey of more interesting projects. Photographs. (A9)

9-A. B.N.F.M.R.A. Service to Industry. B. Fullman and E. C. Mantle. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 187-191.
Services other than direct research provided by the British Non-Ferrous Metals Research Association. Graphs, photographs. (A9)

10-A. Treatment of Machine Shop and Foundry Wastes. C. W. Hathaway and R. E. Harvie. *Sewage and Industrial Wastes,* v. 26, Nov. 1954, p. 1363-1369.
Equipment and techniques for disposing of metalworking oils and the black slurry resulting from the operation of a foundry sand reclamation system. Flow sheets, diagrams.
(A8, G general, E general)

11-A. Control of Accidental Discharge of Cyanide Solutions. B. A. Poole, R. H. Holtje and W. G. Belter. *Sewage and Industrial Wastes,* v. 26, Nov. 1954, p. 1382-1387.
Measures to prevent accidental discharge of plating wastes into a city sewage system. Diagrams.
(A7, L general)

12-A. Survey of Smoke Control. I-II. Roger A. Renwanz and Schaeffer E. Specht. *Steel,* v. 135, Nov. 22, 1954, p. 100, 102, 116; Nov. 29, 1954, p. 76-78.
Applications of precipitators in various metallurgical operations. Table, diagrams. (A8, A7)

13-A. (French.) **Introduction of Cast Iron and Steel Turnings Into the Cupola.** *Fonderie,* 1954, no. 105, Oct., p. 4187-4189.
Enumeration of processes of melting turnings. (A8, E10, ST, CI)

14-A. (German.) **Position of the West German Iron and Steel Industry in the Free Market.** Gerhard Schroeder. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1453-1455.
Market development, scrap, wages, price policy, investments and prospects. Tables. (A4, ST)

15-A. Purity in Metals Aids Their Use. Bruce W. Gonser. *Battelle Technical Review,* v. 3, Dec. 1954, p. 129-130.
Benefits of impurity removal. Results of adding trace elements to high-purity metals.
(A general, B22, Zn, Ti, Ge)

16-A. Non-Ferrous Data for the Chemical Engineer. W. H. L. Hooper and N. P. Inglis. *Chemistry & Industry,* 1954, no. 44, Oct. 30, p. 1334-1348.
Mechanical properties, corrosion and welding of copper, aluminum, titanium and silver alloys. Photographs, graphs, tables, micrograph. 5 ref. (A general, Al, Cu, Ag, Ti)

17-A. Operations Research. Paul Ferencz. *Chemistry in Canada,* v. 6, Nov. 1954, p. 37-40.
Application of new techniques and an illustration of their use by industry to solve problems in inventory and competition. 9 ref.
(A5, S12)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

18-A. Hot Labs. *Nucleonics,* v. 12, Nov. 1954, p. 35-100.
Thirty-six papers on design, construction and operation of laboratory equipment for handling radioactive materials. Data on manipulators and remote equipment for examining, sampling, analyzing, processing and testing chemical and metallurgical specimens. Graphs, photographs, diagrams, tables.
(A9, T5)

19-A. Some Applications of Ultrasonics to Industry. James Kanegis. *U. S. Department of Commerce, Technical Division Reports,* PB 111190, July 1953, 25 p.
Uses in agglomeration, pulverizing, emulsifying, machining, cleaning and nondestructive testing. 120 ref. (A general)

20-A. (Pamphlet.) **Metal Processes and Apparatus, Machinery, and Transportation Equipment.** Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $2.00.
Abstracts of 657 government-owned patents. (A general)

B Raw Materials and Ore Preparation

1-B. Fundamentals of Mixing and Agitation With Applications to Extractive Metallurgy. J. H. Rushton and L. H. Mahony. *Journal of Metals,* v. 6; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1199-1206.
Equipment and practices for improving handling, blending, flotation and leaching operations. Photographs, diagrams, tables, graph. 3 ref. (B14)

2-B. (German.) **Beneficiation of Magnetite Ore Into a High-Percentage Concentrate and Its Further Processing Into Sponge Iron in Persberg (Central Sweden).** Walter Lehnert. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 7, no. 10, Oct. 1954, p. 435-440.
Reasons of smelting for sponge iron; Persberg and other sponge-iron plants; future prospects of sponge-iron production; and comparison of the Wiberg and Höganäs processes. Diagram, photographs, table. 11 ref. (B14, D8, Fe)

3-B. Sweden's Iron Ore. T. L. Joseph. *Blast Furnace and Steel Plant,* v. 42, Nov. 1954, p. 1281-1291.

Compositions, physical properties, production, distribution of exports and uses. Tables, graphs, map, flow-chart, photographs. 8 ref. (B10, Fe)

4-B. New Process for Heat Hardening Taconite Pellets. *Blast Furnace and Steel Plant,* v. 42, Nov. 1954, p. 1299-1303.

Design of equipment for reconstituting fine powder from taconite concentration processes. Diagrams. (B16, Fe)

5-B. How USBM Metallurgists Are Solving the Manganese Shortage. Charles Prasky. *Engineering and Mining Journal,* v. 155, Nov. 1954, p. 72-75.

Beneficiation of low-grade manganese-bearing materials by differential high-temperature sulfatization process. Photographs, diagrams. (B14, Mn)

6-B. How Sulphide Volatilization Can Be Used in Metallurgy. A. W. Schlechten. *Engineering and Mining Journal,* v. 155, Nov. 1954, p. 81-83.

Principles, process and advantages of metal sulfide volatilization in recovery of valuable metals and in eliminating undesirable elements. Diagrams, graph, table. (B14, Cd, Pb, Zr, S)

7-B. How Sheffield's Beneficiation Plant Upgrades Texas Iron Ores. C. Leonard Lloyd, Jr. *Engineering and Mining Journal,* v. 155, Nov. 1954, p. 98-100.

Brief geological background and description of the processing. Photographs. (B14, Fe)

8-B. Sintering of Iron Ore for Blast Furnaces. *Industrial Heating,* v. 21, Nov. 1954, p. 2243-2244, 2246.

Effects of additives, moisture and coke content. (B16, D1, Fe)

9-B. Acid Pressure Digestion of Metal Ores. Phillip M. J. Gray. *Research,* v. 7, Nov. 1954, p. 432-436.

Chemical methods of ore concentration. Engineering aspects. Applications. (B14)

10-B. (German.) **Electrical Dissociation of Molten Slag and Its Use in the Determination of the Basicity of Slag.** Karlheinz Werner. *Metallurgie und Giessereitechnik,* v. 4, no. 9, Sept. 1954, p. 379-384.

Electrochemical and electrical behavior of openhearth and electric furnace slags. Graphs, diagram, tables, photographs. 21 ref. (B21, D2, D5)

11-B. (German.) **Production of Electrolytic Zinc From Zinc Blende of the Freiberg Ore Region.** Kurt Peukert and Willy Schreiter. *Metallurgie und Giessereitechnik,* v. 4, no. 9, Sept. 1954, p. 397-401.

Roasting, leaching and electrolysis. Tables. 4 ref. (B15, B14, C23, Zn)

12-B. (Hungarian.) **Development of a New Type of Hydraulic Separator.** Andras Halasz and Laszlo Demeter. *Banyaszati Lapok,* v. 9, no. 10, Oct. 1954, p. 516-522.

Hungarian experiments with dolomite and pyrite ore for the development of a closed circuit separator. Experimental arrangement, laboratory experiments and evaluation of results. Photograph, tables, graphs. (B13)

13-B. (Hungarian.) **Processing of Calcium-Aluminate Slag in the Alumina Industry.** Istvan Magyarossy, Dénes Bartok and Andras Héjja. *Kohaszati Lapok,* v. 9, no. 10, Oct. 10, 1954, p. 467-474.

Use of concentrated sodium carbonate solutions and possibilities of combining this process with the Bayer process. Diagrams, tables. (B14, Al)

14-B. Metallurgical Tests on Scappoose (Oregon) Iron Ore. J. P. Walsted. *U. S. Bureau of Mines, Report of Investigations* 5079, Oct. 1954, 46 p.

Beneficiation and smelting of Pacific Northwest ore. Tables, graphs, micrographs, photographs. (B14, B10, Fe)

15-B. Wolframite (Iron Manganese Tungstate): Development of Deposits, Chemical Analysis, and Factors Affecting the Yield in the Extraction of the Metal. F. L. Casado. *Henry Brutcher, Altadena, Calif., Translation no.* 3314, 21 p. (From *Revista de la Academia de Ciencias de Madrid,* v. 39, 1945, p. 489-505.)

Study of preparation of tungstates on a pilot-plant scale. Tables. 27 ref. (B general, W)

16-B. Physico-Chemical Principles of the Production of Ferroalloys. V. P. Elyutin and B. E. Levin. *Henry Brutcher, Altadena, Calif., Translation no.* 3405, 27 p. (From *Stal,* v. 7, no. 10, 1947, p. 903-910.)

Thermodynamics of chemical processes underlying the production of ferro-alloys as a basis for selecting the most favorable production process, with special reference to reduction of Ti, Zr, W, Si, Al and Mn. Graphs. 17 ref. (B22, Fe-n)

C

Nonferrous Extraction and Refining

1-C. High Vacuum Technique. Vacuum Refining; Materials of Construction; Ultra-High Vacuum Techniques; Gauges. S. L. Martin. *Chemical & Process Engineering,* v. 35, Oct. 1954, p. 301-305.

Dezincing of lead, system design and gaging reviewed. Table, graph, diagrams. 19 ref. (C25, S14, Pb)

2-C. Furnace Operation and Casting Improved at Copper Cliff. Joseph C. Bischoff. *Journal of Metals,* v. 6, Nov. 1954, p. 1194-1196.

Practices and equipment for continuous production of copper. Photographs, table. 2 ref. (C21, C5, Cu)

3-C. Thoughts on Lead Blast-Furnace Smelting. L. B. Haney and R. J. Hopkins. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1208-1213; disc., p. 1213.

Factors affecting blast furnace operation based on experimental data. Table, diagram, graphs. 5 ref. (C21, Pb)

4-C. (German.) **Removal of Aluminum From Zinc-Containing Copper Alloys.** Edmund R. Thews. *Giesserei,* v. 41, no. 21, Oct. 14, 1954, p. 571-573.

Review of literature on the removal of aluminum by oxidation, especially with the least loss of other components of the alloys. Tables. 18 ref. (C21, Cu, Zn, Al)

5-C. High-Vacuum, High-Temperature Furnace. *Edgar Allen News,* v. 33, Nov. 1954, p. 241-242.

Electrically heated carbon tube furnace designed for melting, annealing and sintering. Tables. (C21, J23, H15)

6-C. Advanacements in Induction Melting. G. W. Holz. *Industrial Heating,* v. 21, Nov. 1954, p. 2226 + 5 pages.

Types of induction melting furnaces. Advantages and principles and typical installations. Photographs, diagrams. (C21, D6)

7-C. A Review of Developments in the Melting, Refining, and Casting of Copper. H. J. Miller. *Institute of Metals, Journal,* v. 83; *Institute of Metals, Bulletin,* v. 2, 1954, p. 167-172.

Trends in metal supplies, new processes, continuous casting, gas reactions in refining. 19 ref. (C21, C5, Cu)

8-C. On the Way: More Zirconium for Nuclear Reactors. *Chemical Engineering,* v. 61, Dec. 1954, p. 112-114, 116.

Steps in the production and purification of zirconium sponge. Photographs, diagram. (C general, T25, Zr, Hf)

9-C. Chemical Engineering Aspects of Titanium Metal Production. R. L. Powell. *Chemical Engineering Progress,* v. 50, Nov. 1954, p. 578-581.

Raw materials, chlorination, purification procedures and reduction methods. Diagrams, table. 6 ref. (C general, Ti)

10-C. Equilibrium and Heat Effect of Aluminum Subchloride Reaction. P. Weiss. *Henry Brutcher, Altadena, Calif., Translation no.* 2949, 14 p. (From *Erzmetall,* v. 3, no. 8, 1950, p. 241-244.)

Exploration of possibility of producing high-purity aluminum from cheaper materials and of recovering pure aluminum from ore without the necessity of electrolysis. Graphs. 17 ref. (C2, Al)

11-C. Electrolytic Production of Ternary Alloys of Nickel With Iron and Molybdenum. T. F. Frantsevich-Zabludovskaya, I. N. Frantsevich and K. D. Modylevskaya. *Henry Brutcher, Altadena, Calif., Translation no.* 3389, 10 p. (Condensed from *Zhurnal Prikladnoi Khimii,* v. 27, no. 4, 1954, p. 413-420.)

Previously abstracted from original. See item 127-C, 1954. (C23, Ni, Fe, Mo)

12-C. Mechanism of Occurrence of Overvoltage at Carbon Anode in the Electrolyte Production of Aluminum. S. I. Rempel and L. P. Khodak. *Henry Brutcher, Altadena, Calif., Translation no.* 3391, 15 p. (From *Zhurnal Prikladnoi Khimii,* v. 26, no. 9, 1953, p. 931-940.)

Previously abstracted from original. See item 38-C, 1954. (C23, Al)

13-C. (French.) **Reduction of Titanium Dioxide by Calcium Silicides. Preparation of Titanium Silicides.** William Freundlich, André Chrétien and Michel Bichara. *Comptes rendus,* v. 239, no. 18, Nov. 3, 1954, p. 1141-1143.

Use of calcium silicides as metallic oxide reducing agents to prepare silicon alloys. Preparation of Ti_5Si and $TiSi_2$. Tables. (C26, Ti)

D

Ferrous Reduction and Refining

1-D. Hydrogen in Steelmaking. H. Epstein, J. H. Walsh and T. B. King. *American Iron and Steel Institute, Preprint,* 1954, 23 p.

Measures for limiting hydrogen content include vigorous boil, prompt tapping, good ladle, runner and mold practice and low moisture in addition materials. Graphs, tables, diagrams. 15 ref. (D general, ST)

2-D. French Patent Solves Fume Problem in Oxygen Steelmaking. Pierre J. Leroy and L. Septier. *Journal of Metals,* v. 6, Nov. 1954, p. 1189-1191.

Equipment, operating procedure

and dust characteristics. Photograph, tables, micrographs. 3 ref. (D3, ST)

3-D. (German.) **The Performance of Silica Brick in the Openhearth Roof.** Kamillo Konopicky. *Stahl und Eisen,* v. 74, no. 22, Oct. 21, 1954, p. 1402-1413.

Refractoriness under load, effects of pore volume and fluxes and permeability and durability. Tables, graphs. 26 ref. (D2)

4-D. (Hungarian.) **Technology of Acid Steel Production.** Andras Toth. *Ontöde,* v. 5, no. 6, June 1954, p. 130-137.

Hungarian experiments using electrical furnaces. Tables, diagrams. (D6, ST)

5-D. Developments in Steel Plant Refractories. L. A. McGill and J. A. Pierce. *American Ceramic Society Bulletin,* v. 33, Nov. 1954, p. 328-331.

Developments in acid, basic and super-duty refractories. Diagram, graphs. (D general)

6-D. A Statistical Investigation Into Factors Affecting the Life of Ladle Linings. J. E. Andrew. *British Ceramic Society, Transactions,* v. 53, Oct. 1954, p. 609-620.

Effects of slag depth, steel composition, teeming time and other variables. Graphs, tables. (D9, ST)

7-D. Steel-Ladle Trials on Fireclay Bricks. H. R. Lahr. *British Ceramic Society, Transactions,* v. 53, Oct. 1954, p. 621-634.

"Split-ladle" tests whereby two or more makes of bricks are built into the same ladle. Photographs, graphs, tables. (D9, ST)

8-D. Performance of Continental Ladle and Runner Bricks. G. Van Gijn. *British Ceramic Society, Transactions,* v. 53, Oct. 1954, p. 635-653.

Examination of the brick before and after use. Tables, diagrams, micrographs, graphs. 5 ref. (D9, ST)

9-D. A Laboratory Test for the Assessment of Ladle Bricks. J. Mackenzie. *British Ceramic Society, Transactions,* v. 53, Oct. 1954, p. 654-665; disc., p. 665-672.

Samples immersed in molten steel with a basic slag on top. Tables, photographs. (D9, ST)

10-D. The Use of Gaseous Oxygen in Open Hearth and Converter Steelmaking. D. J. O. Brandt. *British Steelmaker,* v. 20, Nov. 1954, p. 428-434.

Economics, technical advantages and techniques in current use. Diagrams, graphs, photographs. (D2, D3, CN)

11-D. Modern Steel Plant Teams Continuous Casting With Planetary Mill. E. C. Beaudet. *Iron Age,* v. 174, Nov. 4, 1954, p. 113-120.

Advanced equipment for production of stainless steel billets with high percentage of yield from molten to semifinished steel. Photographs, diagrams. (D9, SS)

12-D. Non-Metallic Inclusions. II. Deoxidation Products and Sulphides. H. B. Bell. *Iron & Steel,* v. 27, Nov. 1954, p. 531-537.

Reactions and effects of various combinations of manganese, silicon, aluminum, zirconium, titanium and calcium. 69 ref. (D general, ST)

13-D. Effect of Secondary Checkers on Open Hearth Furnaces. H. S. Hall. *Iron and Steel Engineer,* v. 31, Nov. 1954, p. 112-122; disc., p. 122-126.

Secondary checkers increase production and reduce fuel requirements. Design and installation details. Graphs, diagrams, photographs. (D2)

14-D. The Problem of Rupture of the Billet in the Continuous Casting of Steel. J. Savage and W. H. Pritchard. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 269-277.

Measurements of friction between billet and mold and of heat transfer through the mold wall. Method for preventing rupture. Diagrams, graphs. 15 ref. (D9, ST)

15-D. Chromium-Oxygen Equilibrium in Liquid Iron. E. T. Turkdogan. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 278-283.

Influence of chromium-oxygen interaction on deoxidation. Decarburization of iron-chromium-carbon melts. Table, graphs. 17 ref. (D general, P12, Fe)

16-D. Oxygen Converter Bids as Steel Industry's Bright New Tool for Lower Cost Production. J. W. Irvin. *Western Metals,* v. 12, Nov. 1954, p. 43-45.

Experience of Kaiser engineers on production of high-quality, low-carbon steel. Photographs, diagram, graphs. (D3, CN)

17-D. (French.) **Decarburization in the Open-Hearth Furnace.** Pierre Vallet. *Revue de métallurgie,* v. 51, no. 10, Oct. 1954, p. 709-722.

Theoretical treatment. Tables, graphs, diagrams. 12 ref. (D2, ST)

18-D. (German.) **The New Large Blast Furnace of the Westfalenhütte Dortmund AG.** Wilhelm Wolf, Franz Heppner, W. Güldner and Paul Wolf. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1456-1464.

Comparison of American and German designs. Construction details and controls. Diagrams, photographs. (D1)

19-D. (German.) **Smelting of Mixed Ore-Coal Briquettes in the Low-Shaft Furnace.** Erich E. Hofmann. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1464-1468.

Comparison with standard blast furnace practice, preparation of burden and operational experience. Diagrams, graphs. (D1, CI)

20-D. (German.) **Blowing of Open Hearth Pig Iron With Oxygen Enriched Air in the Bottom Blown Converter.** Hans Kosmider, Herbert Neuhaus and Arthur Weyel. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1473-1485.

Blowability, dephosphorization, manganese slagging, nitrogen movement, heat requirements and castability of the steel. Graphs, table. 12 ref. (D3, CN)

21-D. (German.) **Blowability of Mixtures of Basic Bessemer and Open-Hearth Pig Iron in the Basic Converter.** Erwin Eickworth and Theo Kootz. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1486-1492.

Dephosphorization, nitrogen adsorption, manganese losses and heat requirements. Graphs, tables. 10 ref. (D3, CN)

22-D. (German.) **Experiments to Melt Pure Iron in High Vacuum.** Franz Wever, Wilhelm Anton Fischer and Helmut Engelbrecht. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1515-1521.

Theoretical considerations of deoxidation by hydrogen and carbon under various conditions. Graph, diagrams, tables. 16 ref. (D8, Fe)

23-D. (German.) **Development of the Oxygen-Blowing Process of Producing Low-Nitrogen Steel.** Arno Ristow. *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 30, Oct. 21, 1954, p. 1004-1005.

New Austrian process and experiences with this method of producing high-quality steel. (D3, CN)

24-D. (Hungarian.) **Steel Manufacture in the Induction Furnace.** Endre Lendvai. *Ontöde,* v. 5, no. 10, Oct. 1954, p. 228-234.

Theory and practical application of resistance, electric arc and induction furnaces. Diagrams. (To be continued.) (D6, ST)

25-D. Continuous Casting of Alloy Steel Billets. T. H. Adair. *Canadian Mining and Metallurgical Bulletin,* v. 47, no. 511, Nov. 1954, p. 740-747; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 57, 1954, p. 478-485.

Review of machines and techniques developed since 1842 and details of Rossi-Junghans machine at Atlas Steels, Ltd. Diagrams, photographs, flow charts. (D9, AY)

26-D. Non-Metallic Inclusions. III. Nitrides and Exogenous Types. H. B. Bell. *Iron & Steel,* v. 27, Dec. 1954, p. 559-565.

Amounts, structures and effects of nitrides, oxidation during pouring, slag and refractory entrapment; inclusions and effects of alloying elements in cast iron; identification of inclusions. 83 ref. (D9, M28, ST, CI)

27-D. Fuel Technology in the Iron and Steel Industry. L. H. W. Savage. *Metal Treatment and Drop Forging,* v. 21, Nov. 1954, p. 495-498, 502.

Heat requirements and losses, flame control, radiation research and temperature distribution in blast furnace foundations. (D1, B18)

28-D. Development of Continuous Casting of Steel. M. P. Newby. *Metal Treatment and Drop Forging,* v. 21, Nov. 1954, p. 506-508.

Research by the British Iron and Steel Research Association. Photographs. (D9, ST)

29-D. On the Combustion Zones in Front of the Blast Furnace Tuyeres. W. Kuczewski and K. Moszoro. *Henry Brutcher, Altadena, Calif., Translation no.* 3396, 22 p. (Abridged from *Hutnik,* v. 20, no. 12, 1953, p. 361-367.)

Previously abstracted from original. See item 72-D, 1954. (D1)

30-D. Melting of the Iron-Chromium-Aluminum Alloy 'Fekhral'. L. V. Marmorshtein. *Henry Brutcher, Altadena, Calif., Translation* no. 3180, 25 p. (From "Iron-Chromium-Aluminum Alloys", 1950, Mashgiz, Moscow, p. 28-46.)

Commercial production of 'Fekhral' alloys having the following composition range: 0.15% C, max., 0.30-1.00% Mn, 0.2-1.0% Si, 12-15% Cr, and 3.5-5.5% Al. Photographs, micrographs. 4 ref. (D general, SS)

31-D. (French.) **Half Siliceous, Half Basic Roofs.** Donney. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 11, no. 11, 1954, p. 2081-2086.

Compares results of runs of open-hearth furnaces with basic roofs or siliceous roofs with those with half basic—half siliceous roofs. Economic advantages. Diagrams. (D2, ST)

32-D. (French.) **Slag Inclusions in Ingots.** Cloppet. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 11, no. 11, 1954, p. 2111-2118.

Factors influencing formation of inclusions at the surface of various special steel ingots during casting. Tables. (D9, ST)

33-D. (French.) **Testing the Use of Fused Pure Silica in an Electric Furnace.** Achard. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 11, no. 11, 1954, p. 2119-2124.

Tests of a silica brick furnace lining. Diagrams, tables. (D5, ST)

34-D. (French.) **Production of Semi-Hard Carbon Steels.** Royer. *Centre de Documentation Sidérurgique, Circu-*

laire d'Informations Techniques, v. 11, no. 11, 1954, p. 2125-2134.

Use of electric steelmaking furnace. Analysis of slags just before tapping (after killing), in the ladle immediately after pouring from the furnace, and in the ladle at the end of casting. Tables, graphs. 5 ref. (D5, D9, CN)

35-D. Statistical Research Into Productivity Increases at Electric Steel Foundries. W. Trommer. *Henry Brutcher, Altadena, Calif., Translation no.* 2939, 9 p. (Condensed from *Giesserei,* v. 38, no. 18, 1951, p. 422-426.)

Previously abstracted from original. See item 378-D, 1951. (D5, ST)

E

Foundry

1-E. Frozen Mercury Method Permits Larger Precision Castings. *Industrial Heating,* v. 21, Oct. 1954, p. 2010, 2012.

New medium for extending industrial design possibilities; increases abilities of foundries to handle larger, complex castings with close tolerance requirements. Diagrams, photograph. (E15)

2-E. (German.) **Cooling and Dedusting Molding Sand.** W. Gesell. *Giesserei,* v. 41, no. 21, Oct. 14, 1954, p. 578-583.

Discussion of and practical suggestions on recovery of used molding sand by dry and wet methods of cooling and dust removing. Diagrams, table, graphs. 10 ref. (E18)

3-E. (Hungarian.) **Hungarian and Foreign Experiences in the Field of Producing Cylinder Bushings by Centrifugal Casting.** Tibor Budinszky and Jozsef Gerédi. *Ontöde,* v. 5, no. 6, June 1954, p. 122-128.

Studies using water-cooled iron molds. Causes of defects. Diagrams, photographs. (E14)

4-E. How Coke Size—Screening—Handling Affect Cupola Melting. Woodrow W. Holden. *American Foundryman,* v. 26, Nov. 1954, p. 38-40.

Proper techniques save coke, increase melting rate and promote maximum temperature. Photographs, graph, tables. (E10)

5-E. System Sand Control. Morris Gittleman. *American Foundryman,* v. 26, Nov. 1954, p. 54-58.

Compromise between sand properties, equipment and economy for efficient operation. Photographs, table. (E18)

6-E. Intricate Investment Castings Require Shop "Savvy". John P. Wright. *American Machinist,* v. 98, Nov. 22, 1954, p. 120-125.

Guide for small jobbing shop practice. Photographs, diagrams. (E15)

7-E. Simplification for Foundry Efficiency. J. Hunter. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Oct. 1954, p. 416-440.

Significance of statistical data from 240 foundries concerning output in relation to size of foundry, costs, output per operator, personnel and output in terms of production method. Tables, graphs. (E general)

8-E. Suggestions for Simplification in Foundry Operations. A. A. Timmins. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Oct. 1954, p. 441-446.

Suggestions for minor improvement in pattern equipment, melting, molding coremaking and fettling. (E general)

9-E. Gray Iron Casting With Exothermic Feeding. V. Grice. *Canadian Metals,* v. 12, Nov. 1954, p. 34, 36, 38-40.

Exothermic technique compensates for natural heat losses giving higher quality and greater economy. Diagrams. (To be continued.) (E23, CI)

10-E. Foundry Practice. IX. The Molten Metal. William H. Salmon and Eric N. Simons. *Edgar Allen News,* v. 33, Nov. 1954, p. 254-255.

After an elementary review of blast furnace practice, describes crucible and hearth melting furnaces. Diagrams. (To be continued.) (E10, D1)

11-E. Tame Bridge Foundry: Short Runs of Heavy and Lightweight Castings. *Engineering,* v. 178, Oct. 15, 1954, p. 505-507.

Plant site and buildings, raw material handling, molding methods, shake-out and sand plant and core making facilities. Photographs. (E general)

12-E. Automation Unit Performs All Operations in Casting of Small Parts. L. F. Miller. *Iron Age,* v. 174, Nov. 4, 1954, p. 128-130.

Integration of 12 operations permits production of up to 300 multiple cavity molds per hr. Diagram, photographs. (E19)

13-E. Casting Quality, Ease of Mechanization Key Shell Mold Advantages. I-II. W. F. Bye. *Iron Age,* v. 174, Nov. 18, 1954, p. 147-150; Nov. 25, 1954, p. 98-101.

New automatic and semi-automatic equipment. Production techniques. Photographs, tables. (E16)

14-E. The British Steel Castings Research Association. J. F. B. Jackson. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 183-186, 191.

Research and development projects of current interest. Diagrams, photographs, micrographs. (E general, A9, CI)

15-E. Precision Controls in Foundry Produce Uniform Quality Meehanite Castings. James Barr. *Western Metals,* v. 12, Nov. 1954, p. 52-54.

Production of high-quality, limited volume castings. Photographs, tables, micrographs. (E11, CI)

16-E. (French.) **Influence of Mineral Black, Pitch, and Sawdust in Green and Stoved Molding Sands.** Pierre Nicolas. *Fonderie,* 1954, no. 105, Oct. p. 4163-4174.

Includes graphs, tables. (E18)

17-E. (French.) **Solidification and Dimensions for Risers. Verification Test and Application of a Theory.** Georges Berger and André Belin. *Fonderie,* 1954, no. 105, Oct., p. 4175-4186.

Theory to determine relation between solidification time and dimensions of cast pieces. Experimental data. Photographs, charts, tables. 6 ref. (E22, E25)

18-E. (German.) **Cast Crank Shafts for Vehicle Construction.** Wolfgang Kilian. *Metallurgie und Giessereitechnik,* v. 4, no. 9, Sept. 1954, p. 401-406.

Designs, technique of molding and casting and results of strength tests. Tables, graph, photographs, diagrams. 4 ref. (E general, Q23, CI)

19-E. (Russian.) **Shrinkage Heads With Internal Gas Pressure for Aluminum-Alloy Castings.** L. M. Cherkasov, G. A. Kaplunovskii, I. I. Pavlenko and A. P. Lubenets. *Liteinoe Proizvodstvo,* 1954, no. 5, Aug., p. 1-3.

Utilization of different pressure-producing charges and their influence on the quality of aluminum castings. Table, graph, photograph. 5 ref. (E25, Al)

20-E. (Russian.) **Elimination of Surface Defects of Pressure Castings by Means of Regulating the Heat Balance of the Mold.** V. M. Pliatskii. *Liteinoe Proizvodstvo,* 1954, no. 7, Oct., p. 3-6.

Experimental investigation of causes of defects and methods of prevention. Tables, diagrams. (E25)

21-E. (Russian.) **Oscillographic Method of Measuring the Rate of Metal Travel in Casting Mold.** T. I. Orlova. *Liteinoe Proizvodstvo,* 1954, no. 7, Oct., p. 25-27.

Basic principles of method, techniques of application. Graphs, tables, diagrams. (E19)

22-E. (Swedish.) **Defects in Castings and Their Causes.** V. Holger Pettersson, G. Fernheden and G. Lindh. *Gjuteriet,* v. 44, no. 9, Sept. 1954, p. 149-156.

Primary causes of scabs, rat-tails, buckles, sandholes, kishes, bums, and parting line seams, and the relations between them. Diagrams, photographs. (E general)

23-E. (Swedish.) **Standard Methods of Testing Foundry Sands.** *Gjuteriet,* v. 44, no. 9, Sept. 1954, p. 157-160.

Revision of 1948 Swedish standards include methods for core sands and binders. Diagrams, photographs. (E18)

24-E. A Practical Method for Vacuum Degassing of Nonferrous Metals. Harold F. Bishop, Edward E. Layne and William S. Pellini. *Foundry,* v. 82, Dec. 1954, p. 78 + 8 pages.

Practical, commercial-type pumps combined with proper risering and gating can produce pressure tight castings. Photographs, micrographs, diagrams. (E22)

25-E. Eliminating Defects in Die Castings. W. M. Halliday. *Foundry,* v. 82, Dec. 1954, p. 84 + 10 pages.

Causes and remedies of parting-line flash, flow marks and porosity. Photographs. (E13)

26-E. Closed-Top Cupolas End Air Contamination. Robert H. Herrmann. *Foundry,* v. 82, Dec. 1954, p. 86-89.

Experience at Ford foundry shows high operating efficiency and almost complete elimination of atmospheric contamination. Drawings, photographs. (E10, A8)

27-E. Modern Methods Employed in Berliet Foundries of France. Vincent Delport. *Foundry,* v. 82, Dec. 1954, p. 90-93, 242.

Equipment, plant layout and techniques for production of heavy castings. Photographs. (E general, A5, CI, Cu, Al)

28-E. Some Properties of Phenolic Resin Core Binders. Carl E. Schubert. *Foundry,* v. 82, Dec. 1954, p. 100-101, 248-251.

Tests on cores baked for various times at 350, 400 and 450° F. Graphs. (E18, E21)

29-E. Centrifugal Casting of Sleeve Bearings. J. B. Mohler. *Foundry,* v. 82, Dec. 1954, p. 102-105.

Types of castings and conditions where the process is economical. Diagrams, photographs. 6 ref. (E14)

30-E. Physicochemical Considerations Regarding the Operation of Acid and Basic Cupolas. H. Schmidt. *Henry Brutcher, Altadena, Calif., Translation no.* 3011, 21 p. (From *Giesserei, Technisch-Wissenschaftliche Beihefte,* 1952, nos. 6-8, p. 273-279.)

Cupola reactions involving sulfur, calcium carbide and phosphorus. Graphs, tables. 8 ref. (E10, CI)

31-E. Use of Oxygen in the Melting of Low-Carbon Superheated Cast Iron (Malleable). V. A. Fuklev. *Henry Brutcher, Altadena, Calif., Translation no.* 3364, 11 p. (From *Liteinoe Proizvodstvo,* v. 5, no. 2, 1954, p. 1-3.)

Previously abstracted from original. See item 425-E, 1954. (E10, CI)

32-E. Melting of Unbriquetted Fine Metal Scrap in the Cupola. Yu. S. Sukharchuk and M. P. Nikolaichik. *Henry Brutcher, Altadena, Calif., Translation no.* 3384, 9 p. (From *Liteinoe Proizvodstvo,* v. 5, no. 1, 1954, p. 30-31.)

Previously abstracted from original. See item 184-E, 1954. (E10, CI, ST)

33-E. Ways of Intensifying the Combustion in the Cupola. L. M. Marienbakh and Yu. S. Sukharchuk. *Henry Brutcher, Altadena, Calif., Translation no.* 3395, 14 p. (From *Liteinoe Proizvodstvo,* v. 3, no. 2, 1952, p. 15-17.)

Study of ways and means of increasing quantity of heat contained in the cupola gases. 13 ref. (E10)

34-E. (Pamphlet.) **Research on Shell Moldings. Massachusetts Institute of Technology.** Report no. PB 111401. 54 p. 1953. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $2.00.

Coarse or rounded sand grains require less resin. Excess resin may be detrimental to surface finish. (E16)

F

Primary Mechanical Working

1-F. Drop Forging in the Railway Industry. I. The Forging Practice of British Railways (Midland Region). *Metal Treatment and Drop Forging,* v. 21, Oct. 1954, p. 469-476.

Equipment and practices for producing wide range of types and sizes of forgings from new material and from scrap. Photographs, diagrams, table. (To be continued.) (F22, ST)

2-F. (French.) **Contribution to the Study of the Heating Cycle of Special Steels in Rolling-Mill Pusher-Type Furnaces.** M. Boutin. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 11, no. 10, 1954, p. 1931-1944.

Selection of furnace, heating curves, quality and regulation of heat, furnace atmospheres, heat consumption, etc. Tables, graphs. 9 ref. (F21, ST)

3-F. Steel and Copper Rod Rolling: A Comparison of Techniques. J. Guthrie and E. Fischl. *Australasian Engineer,* 1954, Sept., p. 52-60; disc., p. 60-63.

Contrasts two types of rolling mills. Construction features, economic factors, pass designs. Diagrams, photographs, table. 3 ref. (F23, Cu, ST)

4-F. Steel Sections for Welding. R. G. Braithwaite. *British Welding Journal,* v. 1, Nov. 1954, p. 481-486.

Production of various shapes and welding techniques for their use. Diagrams. 2 ref. (F general, K general, ST)

5-F. Resistance Heating, Pressure Combined to Rapidly Form Aluminum Extrusion. W. D. Latiano. *Iron Age,* v. 174, Nov. 4, 1954, p. 124-125.

Converted resistance welder provides rapid heating, close control, low heat losses and prevention of overaging. Photographs. (F24, K3, Al)

6-F. A Mechanical Extrusion Press for Producing Tubes and Bars. Astor L. Thurman. *Iron and Steel Engineer,* v. 31, Nov. 1954, p. 64-73; disc., p. 73-74.

Equipment, processes and materials processed. Tables, diagrams, photographs, graphs. (F24, ST)

7-F. Mechanical Features of Modern Bar and Rod Mills. E. C. Peterson. *Iron and Steel Engineer,* v. 31, Nov. 1954, p. 103-108; disc., p. 108-111.

Refinements in engineering and auxiliaries produce better bar and rod at increasing speeds. Photographs, diagrams. (F27)

8-F. An Investigation of Reheating Furnace Design and Performance. F. A. Gray and S. H. Brooks. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 223-266.

Interrelationships of variables affecting billet heating furnaces. Diagrams, photograph, graphs, tables. 8 ref. (F21, ST)

9-F. The Operation of Soaking Pits. J. Dodd. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 297-300 + 1 plate.

Fuel savings by proper control and organization. Photographs. (F21, ST)

10-F. Versatile Pint-Sized Rolling Mills. A. I. Nussbaum. *Modern Metals,* v. 10, Nov. 1954, p. 74, 76, 78.

Research mill can be rapidly converted from two-high to four-high configuration. Photographs, tables. (F23)

11-F. The Rolling of Metals and Alloys. III. E. C. Larke. *Sheet Metal Industries,* v. 31, no. 331, Nov. 1954, p. 947-951, 958.

Causes and control of thickness variations. Photograph, graphs. 5 ref. (To be continued.) (F23)

12-F. Billet Separation by the Shear-Fracture Method. W. C. Tucker. *Steel Processing,* v. 40, Nov. 1954, p. 695-698, 731.

Theory and techniques for cutting steel billets to desired lengths. Photographs, diagrams. (F29, ST)

13-F. Lubricants for Press and Forge Equipment. A. A. Paul. *Steel Processing,* v. 40, Nov. 1954, p. 703-704, 738-739.

Types of lubricants for various applications. (F1)

14-F. Automatic Furnace Line Highly Versatile in Forge Shop Heat Treating. W. F. Herdrich. *Steel Processing,* v. 40, Nov. 1954, p. 723-726, 728.

Design, arrangement and experience with mechanized heat treating installation. Photographs, diagram, tables, micrographs. (F21, ST)

15-F. Plate Edge Preparation. *Welding and Metal Fabrication,* v. 22, Nov. 1954, p. 402-407.

Comments from various fabricators on relative merits of gas cutting and mechanical shearing. Photographs. (F29, ST)

16-F. Quality Control in the Wire Industry. Axel U. Sternlof. *Wire and Wire Products,* v. 29, Nov. 1954, p. 1315-1317.

Installations and procedures for short runs with frequent set-ups. Photographs, graphs. (F28)

17-F. (French.) **Cold Shapes—Preparation and Interest.** A. Ogus. *Métallurgie et la construction mécanique,* v. 86, no. 9, Sept. 1954, p. 643, 645-647, 649.

Production by wire drawing dies and bending presses; comparison between cold shapes and hot rolled products. Diagrams, photographs. (F28, G6, ST)

18-F. (German.) **Induction Heating of Forging Billets.** *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 29, Oct. 11, 1954, p. 990-991.

Power consumption and heating times as functions of diameter of billet and frequency; faster heating in a longitudinal than in a transverse field. Graphs. (F21, J2, ST)

19-F. (German.) **Production of Sheet Metal.** Erich Howahr. *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 30, Oct. 21, 1954, p. 997-1004.

History and description of modern sheet metal rolling mills. Photographs, diagrams. (F23)

20-F. (Italian.) **Fundamentals of Extrusion Theory.** F. Gatto. *Alluminio,* v. 23, no. 5, Oct. 1954, p. 533-545.

Calculations of pressure considering geometry of container, type of alloy, temperature and extrusion rate. Results compared with experimental data. Photographs, diagrams, graphs, tables. 6 ref. (F24)

21-F. (Russian.) **Change of Shape of Prismatic Metallic Specimens During Hammer Upsetting.** A. I. Skonechnyi. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 57-62.

On the basis of experimental data and mathematical analysis, formulas are derived for calculating maximum and minimum deformation during forging. Tables, diagrams. 4 ref. (F22)

22-F. (Polish.) **Lowering the Costs of Wear in Rolls.** Jozef Gorecki. *Hutnik,* v. 21, no. 9, 1954, p. 285-291.

Advantageous design and arrangement of various types of roll passes. Comparative wear figures. Diagrams, table. (F23, Q9)

G

Secondary Mechanical Working

1-G. Ultrasonic Machining of Tungsten Carbide. Dieter Goetze. *Institute of Radio Engineers, Transactions of the I.R.E. Professional Group on Ultrasonics Engineering,* PGUE-2, Nov. 1954, p. 19-22.

Factors affecting operation and results. Graphs. (G17, C-n)

2-G. Dodge Finishes Pistons by Turning. B. W. Bogan. *Machinery,* v. 61, Nov. 1954, p. 170-177.

Need for cam grinding operations is eliminated and quality is improved. Photographs, diagrams. (G17, Al)

3-G. An Ultrasonic Machine Tool. Neil Clark, Jr. *Institute of Radio Engineers, Transatcions of the I.R.E. Professional Group on Ultrasonics Engineering,* PGUE-2, Nov. 1954, p. 10-18.

Theory, design, operation, action and application. Photographs, diagrams, circuits. (G17)

4-G. Cutting Forces: Their Effects on Milling Operations and Milling Cutter Selection. Horace A. Frommelt. *Machine and Tool Blue Book,* v. 49, Nov. 1954, p. 186 + 11 pages.

Relationships between the force and rate at which it is applied in slab, face and straddle, step and duplex and conventional and climb mills. Diagrams. (G17)

5-G. (French.) **Theory Relative to the Influence of Elements and Hexagonal Compounds in Polycrystalline Groups.** A. Paudrat. *Métaux, Corrosion-Industries,* v. 29, no. 349, Sept. 1954, p. 315-334.

Theoretical study of phenomena of dry lubrication, wear resistance and cutting rate during machining of steel. Diagrams, graphs, table. (To be continued.) (G17, Q9, ST)

6-G. Russian Report. Ceramic-Tipped Tools Will Cut Steel. *American Machinist,* v. 98, Nov. 22, 1954, p. 113-115.

Review and evaluation of data in

Russian literature. Diagrams, tables. 8 ref. (G17, ST)

7-G. Electronic Servo Positioning. Walton Rainey. *Automation,* v. 1, Nov. 1954, p. 61-64.

Automatic positioning of workpiece in machine tools. Diagrams, photographs. (G17)

8-G. The Grinding of Steel. XXI. Finishing by Abrasive Belt. *Edgar Allen News,* v. 33, Nov. 1954, p. 256-257.

Belt grinding machines, abrasives, operating procedures. (To be continued.) (G18)

9-G. Symposium on Metal-Working Oils. I. Metal Cutting. *Institute of Petroleum, Journal,* v. 40, Sept. 1954, p. 243-276; disc., p. 276-290.

Includes "Mechanism of Friction and Lubrication in Metal-Working", F. P. Bowden and D. Tabor; "A Preliminary Investigation of the Effectiveness of Various Chlorinated Hydrocarbon Compounds as Cutting Oil Additives", K. J. B. Wolfe, M. D. Kinman, and G. Lennard; "Some Aspects of the Metal Cutting Process", Geo. V. Stabler; "Mechanical Testing of Cutting Oils", I. S. Morton and R. Tourret "Satisfactory Records Are Essential to the Economic Application of Cutting Fluids", H. Grisbrook; and "The Evaluation of Cutting Fluids With Special Reference to Practice in the U.S.A.", A. J. Chisholm. (G21)

10-G. Force, Temperature Measurements Rapid Guide to Tool Life Evaluation. E. A. Loria and D. R. Walker. *Iron Age,* v. 174, Nov. 18, 1954, p. 156-158.

Results are more useful and reliable than wear test data. Tables, graphs, photograph. (G17, Q9, CI)

11-G. The Mechanics of Machining: A New Approach. R. Hill. *Journal of the Mechanics and Physics of Solids,* v. 3, Oct. 1954, p. 47-53.

Method uses a theorem on maximum intensity of singularities in a material that yields when the shear stress attains a critical value. Diagram, tables, graphs. 7 ref. (G17)

12-G. Designing for Production—Retaining. II. W. M. Halliday. *Product Engineering,* v. 25, Nov. 1954, p. 182-183.

Five basic ideas for clamping, holding and clinching parts during machining. Diagrams. (G17)

13-G. Design Possibilities for Automatic Spinning. F. L. Banta. *Product Engineering,* v. 25, Nov. 1954, p. 188-192.

Advantages, limitations and other criteria for determining applicability, comparison of piece costs with stamping operation. Photographs, diagrams, table, graph. (G13, SS, Ti, SG)

14-G. Troubles With Cold Extrusion May Be Traced to Lubrication. J. F. Leland and J. W. Helms. *SAE Journal,* v. 62, Nov. 1954, p. 43-45.

A step-by-step procedure for one recommended coating and lubricating cycle. Photograph. (G5, ST)

15-G. Problems Encountered in the Design of Press Tools. J. A. Grainger. *Sheet Metal Industries,* v. 31, no. 331, Nov. 1954, p. 897-905, 928.

Principles for blanking, piercing and drawing dies. Diagrams, photographs. (To be continued.) (G2, G4, TS)

16-G. Recent B.I.S.R.A. Work on the Elimination of Stretcher Strains in Mild-Steel Pressings. B. B. Hundy. *Sheet Metal Industries,* v. 31, no. 331, Nov. 1954, p. 909-920.

Factors influencing temper rolling and levelling processes. Photographs, graphs, diagrams. 28 ref. (G4, CN)

17-G. (French.) **Hot Machining.** H. Laplanche. *Métallurgie et la construction mécanique,* v. 86, no. 9, Sept. 1954 p. 659, 661-662.

Principles and use for very hard alloys. Test results. Graphs, tables. (G17, SS)

18-G. (Russian.) **Investigation of Temperature in the Case of Super-High Cutting Rates.** E. D. Salomonovich. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 45-46.

Experimentally determines average temperatures at point of contact between cutter made of hard alloy and material being machined. Diagrams. 4 ref. (G17)

19-G. (Russina.) **Determination of Stability Relationships During High-Speed Cutting According to the Hardness of Hard Alloys and Steels in the Hot State.** A. I. Betaneli. *Vestnik Mashinostroeniia,* v. 34, no. 10, Oct. 1954, p. 62-64.

Method for determining stability according to the difference in the hardness of the cutting and cut materials. Nomogram. 4 ref. (G17)

20-G. A Theoretical Investigation of the Temperature Distribution in the Metal Cutting Process. A. C. Rapier. *British Journal of Applied Physics,* v. 5, Nov. 1954, p. 400-405.

Relaxation and analytical methods of solution developed and applied to the work material, the chip and the tool. Diagrams, graphs. 8 ref. (G17)

H

Powder Metallurgy

1-H. Applicability of Powder Metallurgy to Problems of High Temperature Materials. G. M. Ault and G. C. Deutsch. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1214-1226. disc., p. 1227-1230.

Review of attempts to solve high-temperature problems in use of wrought and sintered superalloys, aluminum, molybdenum and cermets. Tables, micrographs, graphs, photographs, diagrams. 47 ref. (H general, SG-h, Co, Al, Mo, C-n)

2-H. Powdered Metal Parts Find Increasing Automotive Applications. D. B. Martin. *Machinery,* v. 61, Nov. 1954, p. 192-197.

Powder processes offer purer, more uniform materials at lower costs. Photographs, diagrams. (H general, T21)

3-H. Pressing Parts From Powdered Metals—A New Concept. Byron B. Belden. *Mechanical Engineering,* v. 76, Nov. 1954, p. 891-896.

Advance in press design permits use of simpler die sets in pressing thin-wall bushings and compacting and pressing flanged parts. Diagrams, photograph. (H14)

4-H. Iron Rotating Bands. John D. Dale. *Ordnance,* v. 39, Nov.-Dec. 1954, p. 498-501.

Production, properties and specifications for sintered iron projectile parts. Tables. (H general, T2, Fe)

5-H. Powder Metallurgy Permits Good Control Over Combined Properties. F. R. Farnham. *Iron Age,* v. 174, Nov. 25, 1954, p. 102-105.

Advantages for use as electrical contacts. Production techniques. Photographs, diagrams, table. 1 ref. (H general, Ag, Ni, Cu, Mo, W)

6-H. Specially Bonded Silicon Carbide. W. L. Wroten. *Materials & Methods,* v. 40, Nov. 1954, p. 83-85.

Silicon nitride as bonding agent gives improved high-temperature strength, closer size tolerances and high abrasion and corrosion resistance. Table, graph, photographs. (H12, C-n)

7-H. Sintering. Carl G. Paulson. *Metal Progress,* v. 66, Nov. 1954, p. 122-123, 176.

Bonding of individual particles during the sintering operation is dependent not only on temperature but also on the proper furnace atmosphere for that temperature. Although the volatile constituents of the binding material are driven off at relatively low temperatures, the chemical reaction of the residue with certain gases rids the compact of these materials to permit the particles to establish a bond with each other. (H15)

8-H. (French.) **Some Aspects of Powder Metallurgy.** Robert Girschig. *Revue de métallurgie,* v. 51, no. 10, Oct. 1954, p. 665-673.

Review of theoretical consequences of differences between cast and sintered metals. Industrial applications. Diagrams, micrograph, graph, photograph. (H general)

9-H. Contribution to the Theory and Practice of Pressing Powdered Materials. C. Ballhausen. *Henry Brutcher, Altadena, Calif., Translation no.* 3393, 21 p. (From *Archiv für das Eisenhüttenwesen,* v. 22, nos. 5-6, 1951, p. 185-196.)

Previously abstracted from original. See item 63-H, 1951. (H14)

10-H. (German.) **Highly Heat-Resistant Sintered Materials.** Richard Kieffer. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning,* v. 25, no. 6, 1954, p. 264-280.

Review of developments in the field of powder metallurgy and cermets. Manufacture and properties of high-temperature alloys, carbides, borides, silicides and oxides. Graphs, tables, diagrams, photographs. 42 ref. (H general)

J

Heat Treatment

1-J. Automatic Gas Carburizing of Automotive Gears. R. J. Peters. *Industrial Heating,* v. 21, Oct. 1954, p. 1938-1940 + 5 pages.

A means for increasing demands for automotive transmissions of relatively constant size but with increasingly greater strength and torque-absorption ability. Photographs, graph, table, diagram. 3 ref. (J28, AY)

2-J. How to Reduce Heat Treating Costs When Using Ammonia. Paul E. Peacock, Jr. *Industrial Heating,* v. 21, Oct. 1954, p. 1952-1954, 1956, 1958.

Economics of an installation for the bright annealing of stainless steel wire. Photographs. (To be continued.) (J23, SS)

3-J. How Austenitizing Conditions Affect Medium Alloy Steels. I-II. A. R. Troiano and R. F. Hehemann. *Iron Age,* v. 174, Nov. 11, 1954, p. 124-126; Nov. 18, 1954, p. 151-153.

Ms temperature can be raised 100° F. in medium alloy steels, thus reducing residual stresses and retained austenite. Graphs, tables, micrographs. 6 ref. (J22, N8, Q25, AY)

4-J. Theory of Gas Atmospheres. A. G. Hotchkiss. *Metal Progress,* v. 66, Nov. 1954, p. 81-86.

Brief consideration of the fundamental scientific principles governing the reactions between hot metal and hot gases. Table, photographs, graphs. (J2)

5-J. Exothermic Atmospheres—Their Generation and Application. W. H. Boyd. *Metal Progress,* v. 66, Nov. 1954, p. 86-89.

The earliest and simplest of the atmosphere generators, the exothermic type, has widest application for heat treatment of constructional alloy and carbon steels. When dried to dew points around −40° F. by solid desiccants, this atmosphere is especially reliable in continuous furnaces which must have entrances and exits open at all times. Graph, diagram, photograph. (J2, ST)

6-J. Endothermic Atmosphere. Ralph J. Perrine. *Metal Progress,* v. 66, Nov. 1954, p. 89-93.

Temperature variation within the catalytic mass and other factors affecting the composition of the prepared gas and its stability after entering the heat treatment furnace. Diagram, tables, graphs. (J2)

7-J. Dry Nitrogen as a Base for Prepared Atmospheres. Donald Beggs. *Metal Progress,* v. 66, Nov. 1954, p. 94-98.

Very dry atmospheres containing substantially nothing but nitrogen and hydrogen (except perhaps a little carbon monoxide on occasion) have proven very useful for scale-free heating, carrier gas, inert atmosphere and purging explosive mixtures. Methods of manufacture and commercial equipment. Diagrams, photographs. (J2)

8-J. Dissociated Ammonia. M. Robert Ogle. *Metal Progress,* v. 66, Nov. 1954, p. 99-101.

A mixture of three parts hydrogen and one part nitrogen, dry—containing about 0.005% moisture by volume—is readily made in an inexpensive catalytic dissociator for liquid ammonia and is useful for bright heat treatment of stainless and high-nickel alloys, for reducing oxides or decarburizing, or for a carrier gas for special purposes. Graph, diagram, photograph. (J2)

9-J. Atmosphere Analysis and Control. Wayne L. Besselman. *Metal Progress,* v. 66, Nov. 1954, p. 102-105.

New equipment is now available for automatic and continuous analysis of furnace atmospheres, notably absorption of infra-red radiation by CO_2, CO, CH_4 and NH_3 (separately), the magnetic oxygen analyzer, and the use of thermal conductivity for hydrogen. Photographs. (J2, S11, S18)

10-J. Elements of Gas Carburizing. Walter H. Holcroft. *Metal Progress,* v. 66, Nov. 1954, p. 106-109.

Modern gas carburizing requires a tight furnace, including proper entrance and exit locks, adequate flow of atmosphere of correct composition, which can be approximately predicted, and time and temperature cycle proper for the desired surface carbon and hardenable depth. Graphs. (J28, J2, ST)

11-J. Equilibrium Relationships for Dew Point Control. Norbert K. Koebel. *Metal Progress,* v. 66, Nov. 1954, p. 110-114.

While equilibrium relationships between constituents of prepared atmospheres are valuable for theoretical, research and developmental studies, heat treating operations in thoroughly reacted endothermic gas are much more adequately controlled by keeping the dew point in the furnace steadily at a correct value. Graphs, table. (J2)

12-J. Dew Point Control in Practice. O. E. Cullen. *Metal Progress,* v. 66, Nov. 1954, p. 114-118.

Since analysis of moisture in furnace gas is so much quicker and more accurate than CO_2 analysis, and improved (even automatic) equipment is available, the trend is toward furnace control by dew point when carburized or heat treated work is specified closely as to surface carbon or carbon penetration. Graphs, diagram. (J2)

13-J. Carbo-Nitriding. Harold N. Ipsen. *Metal Progress,* v. 66, Nov. 1954, p. 119-120.

Principles, advantages over other case hardening methods and equipment. Photograph, diagram. (J28, ST)

14-J. Neutral Heat Treating. A. W. Frank. *Metal Progress,* v. 66, Nov. 1954, p. 121-122.

The prevention of any chemical reaction on the surface of metal being heat treated has been a long-sought objective, but has been realized only recently with the use of furnace atmospheres that are free of oxygen-bearing gases and moisture. Considerable economies are possible with such atmospheres. (J2, ST)

15-J. Gas-Carburizing. *Aircraft Production,* v. 16, Nov. 1954, p. 466-468.

Equipment and methods utilizing a drip-feed liquid for producing a carburizing atmosphere. Photographs, diagram, graphs, table. (J28, CN)

16-J. Fundamentals of Gas Carburizing. Walter Holcroft. *Industrial Heating,* v. 21, Nov. 1954, p. 2196 + 5 pages.

Equipment and methods, determination of case depth. Diagram, graphs, table. (J28, ST)

17-J. Theory of Furnace Gas Atmospheres. Allen G. Hotchkiss. *Industrial Heating,* v. 21, Nov. 1954, p. 2212 + 7 pages.

Gases, equilibrium data, carburizing reactions. Photographs, diagrams, graphs. (J2)

18-J. How to Reduce Heat Treating Costs When Using Ammonia. II. Paul E. Peacock, Jr. *Industrial Heating,* v. 21, Nov. 1954, p. 2234, 2236, 2238.

Operating costs in use of ammonia for hydrogen protection of bright finish of fine stainless steel wire during annealing. Graph, tables. (J2, J23, SS)

19-J. Carburizing Controls at Caterpillar. L. A. Beaudry. *Instrumentation,* v. 7, no. 5, 1954, p. 4-6.

Carburizing cycle and control equipment for pit-type furnaces. Photographs, diagram. (J28, ST)

20-J. Proper Treatments Preserve Properties of Types 321 and 347 Stainless. Hiram Brown. *Iron Age,* v. 174, Nov. 25, 1954, p. 93-95.

Heat treatments and welding techniques required to maintain corrosion resistance. Micrograph, photographs. (J general, K general, R general, SS)

21-J. Measurement of Case Depth After Carburization. J. Taylor. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 291-296.

Empirically derived curves are more reliable than those calculated from mean value of diffusivity coefficient. Tables, graphs. 13 ref. (J28, N1, ST)

22-J. A New Wear-Resisting Treatment. J. Lomas. *Machinery Lloyd (Overseas Ed.),* v. 26, Nov. 6, 1954, p. 83-85.

Sulfurizing of steel and cast iron in a salt bath produces a soft, porous, but very wear resistant surface. (J28, Q9, CI, CN)

23-J. Special Atmosphere Graph for Heat Treatment Prepared From Natural Gas Analyses. *Materials & Methods,* v. 40, Nov. 1954, p. 135.

Chart for computing heat treating atmospheres. (J2)

24-J. Induction Heat Treating. Harry B. Osborn, Jr. *Metal Progress,* v. 66, Nov. 1954, p. 125-129.

Case histories indicate trend in induction heating toward ingenious fixtures for handling the work, often automatically, through cycles which produce selectively hardened areas to close specification. Costs are often cut further by using alloy and more readily machinable steel than required for older heat treating processes. Photographs. (J2, ST)

25-J. Controlled Atmosphere Heat Treating. I-II. Henry M. Heyn. *Steel,* v. 135, Nov. 22, 1954, p. 96-98; Nov. 29, 1954, p. 72-74.

Preparation of atmospheres, furnaces and control of compositions. Photograph, graphs, table. (J2, ST)

26-J. The Response to Heat Treatment of 18-8 Wires Given Various Percent Cold Reductions. Samuel Storchheim. *Wire and Wire Products,* v. 29, Nov. 1954, p. 1327-1330.

Possibilities of producing a highly magnetic state by repeated cold work and annealing at 1225° F. Tables, graphs. 2 ref. (J23, P16, SS)

27-J. (French.) **Electric Furnaces Having Submerged Electrodes.** *Métallurgie et la construction mécanique,* v. 86, no. 9, Sept. 1954, p. 671, 673.

Operating characteristics and advantages of salt bath furnaces. Photograph, diagram. (J2)

28-J. (German.) **Physics of Flame Hardening.** W. Marfels. *Schweissen und Schneiden,* v. 6, no. 10, Oct. 1954, p. 411-416.

Advantages, transformations, mechanical properties of surface and core, and distortion. Graphs, micrographs, diagrams. 8 ref. (J2, Q general, ST)

29-J. (Russian.) **Heat Treatment of Steel 18KhGT, With Application of a Solid Carbonizer.** K. A. Kashchenko. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 62-65.

Investigation for purpose of replacing steel 12KhN2 in the manufacture of equipment for the autotractor industry. Tables, graphs. (J28, AY)

30-J. Fundamentals of Annealing of Cold-Rolled Steel Strip. A. Pomp. *Henry Brutcher, Altadena, Calif., Translation no.* 3087, 14 p. (Abridged from *Stahl und Eisen,* v. 73, no. 3, 1953, p. 133-138.)

Previously abstracted from original. See item. 89-J, 1953. (J23, CN)

31-J. Continuous Annealing of Cold Rolled Low Carbon Steel Strip. II. K. H. Muhr and A. Pomp. *Henry Brutcher, Altadena, Calif., Translation no.* 3360, 16 p. (Abridged from *Stahl und Eisen,* v. 73, no. 14, 1953, p. 891-894.)

Results of continuous annealing experiments on seven grades of steel strip studied at different speeds of travel through the furnace and different rates of cooling in two temperature ranges to explore the effect of the annealing time on the tensile and deep drawing properties and microstructure. Photographs, graphs. 23 ref. (J23, CN)

32-J. Annealing of Malleable Iron Checked by the Magnetic Properties. K. P. Zhadnov. *Henry Brutcher, Altadena, Calif., Translation no.* 3383, 4 p. (From *Liteinoe Proizvodstvo,* v. 5, no. 1, 1954, p. 29-30.)

Previously abstracted from original. See item 109-J, 1954. (J23, P16, Q29, CI)

33-J. (Russian.) **Isothermal Hardening of Alloy Tool Steels.** Iu. A. Geller. *Stanki i Instrument,* v. 25, no. 10, Oct. 1954, p. 16-20.

Effects of temperature and time of holding on mechanical and physical properties. Graphs. 10 ref. (J26, Q general, P general TS)

K

Joining

1-K. Mechanization of Argon-Arc Welding. J. P. Crum. *Aircraft Engineering,* v. 26, Oct. 1954, p. 360-364, 366.

Experience with inert-gas-shielded-arc welding of light alloys. Photographs, table, diagrams. (K1, EG-a)

2-K. Adhesive Bonding. George Epstein. *Machine Design,* v. 26, Nov. 1954, p. 217-220.

Bonding procedure, advantages and conditions for joining metals and plastics. Photographs. (K12)

3-K. Argon-Arc Welding. *Aircraft Production,* v. 16, Nov. 1954, p. 430-435.

Development of equipment for mechanized application of tungsten-electrode and consumable-electrode processes. Photographs, tables, diagram. (K1)

4-K. The Riveting of Aluminium. *Aluminium Development Association, Information Bulletin No.* 8, Sept. 1954, 62 p.

Design factors for riveted joints, manufacture of rivets, riveting techniques. Tables, diagrams, photographs. 20 ref. (K13, Al)

5-K. The Glass Sealing Properties of Titanium and Zirconium. H. Rawson and E. P. Denton. *British Journal of Applied Physics,* v. 5, Oct. 1954, p. 352-353.

Thermal expansion characteristics, sealing techniques, strength of seals. Photograph, graphs, diagrams. (K11, Ti, Zr)

6-K. Trends in Modern Shipyard Welding. R. J. W. Rudkin. *British Welding Journal,* v. 1, Nov. 1954, p. 487-494.

Structural design, edge preparation, comparison of machine and hand welding, quality control, prevention of failures and cost reduction. Diagrams, photographs, tables, graphs. 2 ref. (K general, ST)

7-K. Welding in the Aero-Engine Industry. F. G. C. Sandiford. *British Welding Journal,* v. 1, Nov. 1954, p. 495-504.

Organization of production, special equipment and new methods. Diagrams, photographs. (K general, ST)

8-K. Fusion Welding of Aluminium Alloys. IV. Preliminary Tests on High-Strength Heat-Treatable Aluminium Alloys. W. G. Hull and D. F. Adams. *British Welding Journal,* v. 1, Nov. 1954, p. 513-521.

Testing program. Welding characteristics of aluminum-copper alloys. Tables, photographs, graph. 5 ref. (K1, K9, Al, Cu)

9-K. Push Button Pipe Welding With an Automatic Hidden-Arc Technique. E. E. Walden. *Canadian Metals,* v. 12, Nov. 1954, p. 56, 58, 60.

Machine achieves greater penetration, higher quality and better appearance without glare or fumes. Savings of up to 70% of time for manual welding. (K1, CN)

10-K. Automatic Percussion Welding. A. L. Quinlan. *Communication and Electronics,* 1954, Nov., p. 561-565.

Equipment, advantages of process, electrical circuits. Photographs, diagrams, graphs. (K3)

11-K. Adhesive Bonding. Helmut Thielsch. *Materials & Methods,* v. 40, Nov. 1954, p. 113-128.

Types of bonding agents, properties and how they can be altered, applications and manufacturers. Photographs, tables, graphs, diagram. (K12)

12-K. The British Welding Research Association. K. Winterton. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 169-174.

Survey of more important aspects of current work. Photographs. (K general, A9)

13-K. Conducting Primer for Resistance Welding. (Digest of "A New Type of Primer for Resistance Welding", by A. J. Elleman and N. D. P. Smith, paper No. 21, Fourth International Conference on Electrodeposition and Metal Finishing, London, Apr. 23, 1954. *Transactions of the Institute of Metal Finishing, 1954*). *Metal Progress,* v. 66, Nov. 1954, p. 168-170.

Coatings made conductive by addition of metal powders for protecting inner surfaces of spot welded assemblies. (K3, ST)

14-K. Metal-Bonding Adhesives With Improved Heat Resistance. John M. Black and R. F. Blomquist. *Modern Plastics,* v. 32, Dec. 1954, p. 139 + 4 pages.

Progress report on development of adhesives with greater resistance to temperatures up to 600° F. Tables. 7 ref. (K12)

15-K. A New Production Brazing Process. C. A. McFadden. *Modern Metals,* v. 10, Nov. 1954, p. 57-59.

Method of brazing aluminum sheathed nichrome heating elements to aluminum cooking utensils gives 400% increase in heating efficiency. Photographs. (K8, Ni, Al)

16-K. Print—Roll—Inflate. *Modern Metals,* v. 10, Nov. 1954, p. 86, 88.

New roll-bonding process creates maze of tubing from two sheets of aluminum. Photographs, micrograph. (K5, Al)

17-K. The Importance of Design in Welding. H. Gerbeaux. *Sheet Metal Industries,* v. 31, no. 331, Nov. 1954, p. 933-938.

Principles of design of welded structures. Diagrams. (To be continued.) (K general)

18-K. Welded Steelwork for a New Highway Bridge. Alan Heathcote. *Welding and Metal Fabrication,* v. 22, Nov. 1954, p. 408-415.

Welding techniques and sequences. Photographs, diagrams. (K general, T26, CN)

19-K. Mechanization of Argon Arc Welding. *Welding and Metal Fabrication,* v. 22, Nov. 1954, p. 424-429.

Practices for welding aluminum plate. Photographs, diagrams, tables. (K1, Al)

20-K. Metallurgical Principles of Metal Bonding. M. S. Burton. *Welding Journal,* v. 33, Nov. 1954, p. 1051-1057.

Fundamentals of soldering, brazing and welding. Diagrams, micrographs, photograph. (K general)

21-K. Spot Welding Aluminum Alloys With Single-Phase Equipment. J. F. Harris. *Welding Journal,* v. 33, Nov. 1954, p. 1058-1072.

Basic schedule data using a shaped wave form for 12 variations of size and composition. Tables, photographs, graphs, micrographs. (K3, Al)

22-K. Improved Semi-Automatic Welding and Hard Facing. Howard S. Avery, Turner G. Brashear, Jr., Henry J. Chapin and Gerald H. Edmunds. *Welding Journal,* v. 33, Nov. 1954, p. 1073-1079.

New device combines advantages of automatic welding with flexibility of manual welding. Photographs, diagram, tables, graph. 4 ref. (K1)

23-K. Shielded-Inert-Gas Metal-Arc Welding of Carbon Steel. J. R. Craig. *Welding Journal,* v. 33, Nov. 1954, p. 1080-1086.

Application data for successful procedures. Photographs, tables, diagrams. (K1, CN)

24-K. High-Temperature Alloy Fusion Brazing for Titanium and Titanium Alloys. Roger A. Long and Robert R. Ruppender. *Welding Journal,* v. 33, Nov. 1954, p. 1087-1090.

A titanium-nickel-copper-cobalt alloy for furnace brazing titanium. Graphs, photograph, micrograph. 5 ref. (K8, Ti)

25-K. Investigation of Factors Determining the Tensile Strength of Brazed Joints. Nikolajs Bredzs. *Welding Journal,* v. 33, Nov. 1954, p. 545S-563S.

Plastic constraint and strength of base metal are primary factors in strength of properly made brazed joints. Effects of gas inclusions and interface imperfections. Graphs, diagrams, photographs, tables. 15 ref. (K8, Q23, ST)

26-K. Local Buckling of Intermittently Welded Structural Members. C. H. Norris and J. B. Scalzi. *Welding Journal,* v. 33, Nov. 1954, p. 564S-578S.

Test results indicate critical gap-width ratios should be incorporated in specifications. Intermittent welding should not be used in dynamically loaded members. Diagrams, graphs, tables, photographs. 6 ref. (K general, Q28, CN)

27-K. (German.) **Economy of High Efficiency Electrodes.** Hans Hülsewig. *Schweissen und Schneiden,* v. 6, no. 10, Oct. 1954, p. 400-410.

Description, melting rate, costs and mechanical properties of weld metal. Graphs, diagrams, tables, photographs. 6 ref. (K1, Q general, ST)

28-K. (Russian.) **New Type of Glue for Fastening Sheet Polyisobutylene to Metal.** A. P. Pisarenko and R. A. Reznikova. *Legkaia Promyshlennost',* v. 14, no. 10, Oct. 1954, p. 23-26.

Compositions, strength and other properties of glues. Tables, graphs. (K12)

29-K. (Russian.) **Spot Welding of a Heavy Armature.** S. S. Levi. *Mekhanizatsiia Stroitel'stva,* v. 11, no. 10, Oct. 1954, p. 5-9.

Welding procedures, size and strength of weld. Tables, graphs, photograph. (K3, ST)

30-K. (Russian.) **Consumable-Electrode Arc Welding of Stainless Steels in a Medium of Inert Gases.** A. V. Petrov. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 68-70.

Study of welding in argon and helium and properties of the welds obtained. Diagram, photographs, table. (K1, SS)

31-K. (Russian.) **Apparatus for Automatic and Semi-Automatic Welding at the Institute of Electric Welding Named for Academician S. O. Paton of the Academy of Sciences of the Ukrainian SSR.** E. O. Patona AN USSR. B. E. Paton and P. I. Sevbo. *Vestnik Mashinostroeniia,* v. 34, no, 10, Oct. 1954, p. 36-43.

Construction of various automatic welding apparatuses, characteristic types of automatic and semi-automatic welding equipment. Photographs, sketch. (K general)

32-K. **Welding for Fabrication.** D. C. Martin. *Battelle Technical Review,* v. 3, Dec. 1954, p. 125-128.
Advantages of gas-shielded-arc welding. Improvements in welding electrodes. Present and future applications of welding. Photograph. (K1)

33-K. **Carbon Arc Welding of Copper.** *Industry and Welding,* v. 27, Dec. 1954, p. 58-63.
Proper welding techniques, joint preparation and metallurgical changes. Tables. (K1, Cu)

34-K. (French.) **Applications of Welding Processes in the Construction of French Railway Rolling Stock.** P. Salmon. *Soudure et Techniques connexes,* v. 8, nos. 9-10, Sept.-Oct. 1954, p. 251-272.
Methods and equipment for welding heavy sections. Diagrams, photographs.
(K general, T23, Al, ST)

L

Cleaning, Coating and Finishing

1-L. **Electroformed Gauges and Dies.** *Automobile Engineer,* v. 44, Oct. 1954, p. 403-404.
Principle, application, economics and advantages of the method for producing precision cavities in hard nickel. Photographs. (L18, Ni)

2-L. **Iriditing Replaces Anodizing at Lockheed.** Gilbert C. Close. *Aviation Age,* v. 22 Nov. 1954, p. 148-153.
New treatment for applying a corrosion resistant base coating on aluminum alloys used in aircraft construction. Photographs, tables.
(L15, L19, Al)

3-L. **Accurate Combustion Control Improves Galvanizing Quality and Economy.** *Industrial Heating,* v. 21, Oct. 1954, p. 1963-1964, 1966, 2106.
Outline of process and significance of proper application and control of gas fuel. Photographs, diagrams, graph. (L16, Zn)

4-L. **Compact Unit Plates Heavy Ductile Coatings on Steel Wire.** Herbert Kenmore. *Iron Age,* v. 174, Nov. 11, 1954, p. 117-119.
Equipment, metal savings and applications. Photographs, graph.
(L17, T general, ST, Cu, Ni, Zn, Sn)

5-L. **The Silent Enemy.** E. A. Stockbower. *Ordnance,* v. 39, Nov.-Dec., p. 502-505.
Coatings for prevention of corrosion of military equipment. Table, photographs. (L general, T2, Al, ST)

6-L. **A Practical Application of Electroless Nickel Plating.** John D. MacLean and Seymour M. Karten. *Plating,* v. 41, Nov. 1954, p. 1284-1287; disc., p. 1287.
Plates 0.00006 to 0.00008 in. can be deposited in 8 min. with good uniformity. Photographs, diagrams. (L14, Ni)

7-L. **Disposal of Plating Wastes at a Silverware Plant.** Barnett F. Dodge and Charles A. Walker. *Plating,* v. 41, Nov. 1954, p. 1288-1294; disc., p. 1294-1295.
Removal of contaminants and recovery of silver. Tables, flow charts.
(L general, A8, Ag)

8-L. **The Technology of Liquid Buffing Compositions.** Robert V. Twyning. *Plating,* v. 41, Nov. 1954, p. 1296-1299; disc., p. 1300.
Principles and practices for producing satisfactory finishes. 8 ref. (L10)

9-L. **Effect of Anode Composition in Acid Copper Plating.** R. P. Nevers, R. L. Hungerford and E. W. Palmer. *Plating,* v. 41, Nov. 1954, p. 1301-1305; disc., p. 1305-1306.
Adding 0.02 to 0.03% of phosphorus to anodes eliminates sludge formation and promotes more efficient deposition. Tables, photograph, micrographs. 3 ref.
(L17, Cu)

10-L. **Effect of Impurities and Purification of Electroplating Solutions.** D. T. Ewing, J. K. Werner, C. J. Owen, W. O. Dow and R. J. Rowe. *Plating,* v. 41, Nov. 1954, p. 1307-1311; disc., p. 1311.
Effects of lead on nickel plate and removal of lead from plating solutions. Tables, graphs. 7 ref.
(L17, Ni, Pb)

11-L. (Polish.) **Removal of Scale by High-Pressure Water.** Zygmunt Polek. *Hutnik,* v. 21, no. 6, June 1954, p. 172-176.
Techniques and equipment for scale removal in connection with the rolling of sheet metal. Diagrams. 4 ref. (L12, CN)

12-L. (Russian.) **Problem of Anode Deposits Obtained During the Electrolysis of Silver Salts.** I. M. S. Skanavi-Grigor'eva and I. L. Shimanovich. *Zhurnal Obshchei Khimii,* v. 24, no. 9, Sept. 1954, p. 1490-1495 + 1 plate.
Chemical composition and crystalline structure of deposits on platinum anode. Relation of silver in anode to silver deposited at cathode. Micrographs, tables. 9 ref. (L17, Ag)

13-L. **A Report on a Study of Primers for Ferrous Metals in an Atmospheric Exposure.** *American Paint Journal, (Convention Daily),* v. 39, Nov. 20, 1954, p. 20 + 6 pages.
Evaluation of properties of a number of primer systems. Tables.
(L26, L14, ST)

14-L. **Mechanisms of Paint Film Breakdown.** *American Paint Journal, (Convention Daily),* v. 39, Nov. 18, 1954, p. 20-29.
Results of 12-month Florida exposure tests on bonderized steel panels. Graphs, tables. (L26, CN)

15-L. **Paint Industry Literature Classification.** *American Paint Journal, (Convention Daily),* v. 39, Nov. 20, 1954, p. 30-36.
Analysis of variables, coding system, source indexes. Tables, punched card replicas. (L26, U8)

16-L. **Corrosion.** John Gehant. *American Paint Journal,* v. 39, Nov. 22, 1954, p. 71 + 7 pages.
Surveys latest findings and part coatings play. Table.
(L26, R general)

17-L. **Shipbottom Paints.** W. J. Francis. *American Society of Naval Engineers, Journal,* v. 66, Nov. 1954, p. 857-866.
Past, present and future research and development on anticorrosive and antifouling shipbottom compositions. Photographs. (L26)

18-L. **Electrolytic Descaling.** F. E. Cook, H. S. Preiser and J. F. Mills. *American Society of Naval Engineers, Journal,* v. 66, Nov. 1954, p. 1005-1050.
Electrical method of rust removal from tanker ship compartments. Graphs, diagrams, tables, photographs. 28 ref. (L13, ST)

19-L. **Shop Experience in the Enameling of Aluminum.** H. V. Penton. *Ceramic Age,* v. 64, sec. 1, Oct. 1954, p. 52-53.
Processing difficulties and corrective measures. (L27, Al)

20-L. **How to Select, Prepare and Apply Colors in Porcelain Enameling.** William G. Coulter. *Ceramic Industry,* v. 63, Nov. 1954, p. 92, 107.
Preparation of frits. Effects of temperature on fired color. (L27)

21-L. **Lanolin Rust Preventatives.** G. F. Wood and A. C. Benson. *Corrosion Technology,* v. 1, Nov. 1954, p. 328-329.
Low-cost coatings can give relatively long-time protection against water, acids, alkalies and salts. Photograph. (L26, ST)

22-L. **Contact Rectifiers for Electrolysis Installations.** G. Krahl and P. F. Stritzl. *Industrial Chemist and Chemical Manufacturer,* v. 30, Oct. 1954, p. 472-474.
Equipment, comparison with other means of conversion. Photographs, diagrams, graph. (L17)

23-L. **Phosphating.** R. F. Drysdale. *Institute of Metal Finishing, Bulletin,* v. 4, Autumn 1954, p. 203-218.
Review of modern methods, factors affecting formation and crystal growth of coatings. 11 ref.
(L14, ST)

24-L. **Organic Protective and Decorative Coatings for Metal Containers.** T. G. Green and M. Thomas. *Institute of Metal Finishing, Bulletin,* v. 4, Autumn 1954, p. 227-236; disc., p. 237-238.
Types of lacquers and application methods for use with various foods. Diagram, photograph. 8 ref.
(L26, CN)

25-L. **Modernized Facilities Plate Gravure Cylinders Better and Faster.** J. H. Molitor. *Iron Age,* v. 174, Nov. 25, 1954, p. 96-97.
Copper fluoborate bath gives fine-grained, ductile deposits and cuts plating time. Photographs. (L17, Cu)

26-L. **Hard Coatings for Aluminum Alloys.** (Digest of "Study of Hard Coatings for Aluminum Alloys", by F. J. Gillig; *WADC Technical Report* 53-151, May 1953 and Supplement I, Oct. 1953.) *Metal Progress,* v. 66, Nov. 1954, p. 162, 164.
Study of the Martin hard coat process to determine effects of coating on mechanical and corrosion properties of various aluminum alloys. (L24, Q general, R general, Al)

27-L. **Iridite No. 14 for Protecting Aluminum Alloys.** W. Casteli. *Modern Metals,* v. 10, Nov. 1954, p. 42, 44-45.
Dip method of chromate conversion coatings gives low-cost corrosion resistance and paint adherence. Photographs. (L16, Al)

28-L. **Steel-Container Treatments. I.** L. J. Nowacki, E. R. Mueller and R. H. Dent. *Modern Packaging,* v. 28, Nov. 1954, p. 163-166, 246, 248.
Effects of phosphate and other pre-treatments on drum enamels. Salt spray and outdoor weathering tests. Photographs, tables. (To be continued.) (L14, R11)

29-L. **Factors Influencing the Efficiency of Electric Infra-Red Drying and Baking.** Leo Walter. *Organic Finishing,* v. 15, Nov. 1954, p. 6-9.
Processing sheet metal articles coated with lacquers and varnishes, heat penetration, baking schedules, heating elements and control equipment. Diagrams, graphs, photograph. (L26)

30-L. **Surface Coatings for Cans and Tubes.** W. E. Allsebrook. *Paint Manufacture,* v. 24, Nov. 1954, p. 384-386.
Requirements for lacquers used to protect tinplate. Problems of coatings for collapsible tubes. Photographs. (L26, CN, Al, Sn, Pb)

31-L. **The Direct Application of Finish-Coat Enamels to Sheet Steel. General Considerations.** A. W. Murdoch. **Shop Practice.** B. Zick. *Sheet Metal Industries,* v. 31, no. 331, Nov. 1954, p. 939-945.
Development of enamels, metal

preparation and details of commercial processes. Table. (L27, ST)

32-L. Coated Containers—You Can Get More Into Them. L. J. Nowacki. *Steel,* v. 135, Nov. 8, 1954, p. 92-93, 114.

Properties and advantages of organic coatings for lining steel drums. Photographs. (L26, CN)

33-L. Bend Around Galvanizing Embrittlement. R. W. Sandelin. *Steel,* v. 135, Nov. 22, 1954, p. 92-94.

Tests show that cold work is cause. Aluminum-killed steel is least susceptible. Photographs, table. (L16, Q23, CN, Zr)

34-L. Relation Between Roughness of Interface and Adherence of Porcelain Enamel to Steel. J. C. Richmond, D. G. Moore, H. B. Kirkpatrick and W. N. Harrison. *U. S. National Advisory Committee for Aeronautics, Report* 1166, 1954, 9 p.

Studies of porcelain-enamel ground coats prepared and applied under conditions that gave various degrees of adherence between enamel and a low carbon steel (enameling iron). Tables, graphs, micrographs. 18 ref. (L27, CN)

35-L. Flow-Coat System at Douglas Gives Uniform Quality Finish on Jet Parts. G. T. Sink and H. W. Nerpel. *Western Metals,* v. 12, Nov. 1954, p. 46-48.

Equipment and procedures in automatic paint line. Photographs, table. (L26)

36-L. Composite Wires by Electroplating. Edward C. Slick. *Wire and Wire Products,* v. 29, Nov. 1954, p. 1324-1326, 1362-1368.

Plating procedures, corrosion resistance, strength and ductility of copper plated steel wire. Photographs, graph. 8 ref. (L17, R general, Q23, Cu, ST)

37-L. (French.) **Boronizing, Siliconizing, and Boro-Siliconizing of Steels by Electrolysis.** P. Blum and J. L. Andrieux. *Revue de métallurgie,* v. 51, no. 10, Oct. 1954, p. 679-682; disc., p. 682.

Baths and techniques for various alloy steels, mechanism of double cementation. Tables. 4 ref. (L15, AY)

38-L. (French.) **Two New Results Relative to the Composition of Electropolishing Baths.** P. Brouillet and I. Epelboin. *Revue de métallurgie,* v. 51, no. 10, Oct. 1954, p. 693-701; disc., p. 701.

Theory of electrolysis, behavior of electrode layers, and polishing of germanium and platinum. Graphs, micrographs. 7 ref. (L13, Ge, Pt)

39-L. (German.) **Preparative Treatment of Metal Surfaces for Purposes of "Tinning" in the Pouring of Bearing Shells.** Edmund R. Thews. *Metalloberfläche,* Ausgabe A, v. 8, no. 11, Nov. 1954, p. 165-171.

Proper cleaning and tin coating of shell surfaces, fluxes, copper plating of bearing shells, bath compositions and plating conditions, tinning techniques. Diagrams. 5 ref. (L17, L16)

40-L. (German.) **Further Development of the Technique of Metal Spraying.** Hans Reininger. *Metalloberfläche,* Ausgabe B, v. 6, no. 11, Nov. 1954, p. 163-166.

Review of literature on protection against scaling, metal spraying of bearings and repairs by metal spraying. Photographs. 34 ref. (L23)

41-L. (German.) **Zinc Plating and Painting.** Wilhelm Brachmann. *Metalloberfläche,* Ausgabe A, v. 8, no. 11, Nov. 1954, p. 172-176.

Protection against corrosion by combining metallic with nonmetallic protective coatings; methods of securing good adhesion. Photographs. 37 ref. (L17, L26, Zn)

42-L. (German.) **Advances in the Field of Metallizing. Cathode Dispersion, Anode Dispersion, High-Vacuum Vaporization, and Decomposition of Gaseous Metal Compounds.** A. Schwarz. *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 30, Oct. 21, 1954, p. 1009-1013.

Review of literature and description of principles of above methods. 17 ref. (L23, L25, L15)

43-L. (Italian.) **Treatment of Aluminum and Its Alloys by Alternating Current in a Chromic Anhydride Bath.** L. Guerreschi. *Alluminio,* v. 23, no. 5, Oct. 1954, p. 515-532.

Conditions for anodizing plates. Tables, diagrams. 24 ref. (L19, Al)

44-L. (French.) **An Improved Barrel Finishing Process.** Sixten Arensten. *Métallurgie et la construction mécanique,* v. 86, no. 9, Sept. 1954, p. 683 + 5 pages.

Treatment of iron, steel and most current metals in industry. Process consists in deburring, finishing, waxing and polishing. Diagrams, photographs. (L10, ST, Fe)

45-L. (Russian.) **Electrodeposition of Chromium.** A. T. Vagramian and D. N. Usachev. *Doklady Akademii Nauk SSSR,* v. 98, no. 4, Oct. 1, 1954, p. 605-607.

Polarization of cathode, current density, reduction rate of chromic acid, electrode potentials. Graphs. 11 ref. (L17, Cr)

46-L. Analysis of Electroplating Solutions. II. Estimation of Boric Acid in the Presence of Nickel and Ammonium Salts. M. R. Verma and K. C. Agrawal. *Electroplating and Metal Finishing,* v. 7, Nov. 1954, p. 403-404.

Analytical techniques. 9 ref. (L17, S11)

47-L. Progress in Vacuum Metallising. *Electroplating and Metal Finishing,* v. 7, Nov. 1954, p. 409-412.

Equipment and techniques for applying metal films to plastics. Photographs, diagram. 2 ref. (L23)

48-L. Good Phosphating Practice. H. A. Holden. *Electroplating and Metal Finishing,* v. 7, Nov. 1954, p. 416-418.

Emphasizes interdependence of various operations. Tables. 2 ref. (L14)

49-L. Selection of Metal Cleaning Methods. *Electroplating and Metal Finishing,* v. 7, Nov. 1954, p. 420-424.

Techniques for cleaning various steel parts. (L10, L12, ST)

50-L. Electrodeposition and the Printing Trade. J. Riley. *Institute of Metal Finishing, Bulletin,* v. 4, Spring 1954, p. 47-62.

Processes used and special requirements. 2 ref. (L24, T9)

51-L. Practical Colour Matching on Anodic Films. A. E. Bratt. *Institute of Metal Finishing, Bulletin,* v. 4, Spring 1954, p. 63-76.

Factors influencing dye behavior and test procedures. (L19, Al)

52-L. Electroless Plating Comes of Age. Abner Brenner. *Metal Finishing,* v. 52, Nov. 1954, p. 68-76; Dec. 1954, p. 61-68.

Details of process, advantages, properties of deposits of nickel and cobalt, equipment, pretreatment, bath characteristics, economics, need of further research. Tables, photographs, graphs. 49 ref. (L14, Ni, Co)

53-L. Tin Plate Production at Kaiser Steel Corp. West Coast Plant. Fred A. Herr. *Metal Finishing,* v. 52, Nov. 1954, p. 77-82, 87.

Equipment for hot dip and electrolytic tinning. Photographs. (L16, L17, Sn, CN)

54-L. Surface Treatment and Finishing of Light Metals. V. Chemical Conversion Coatings. S. Wernick and R. Pinner. *Metal Finishing,* v. 52, Nov. 1954, p. 83-87.

Properties of coatings for aluminum. Graphs, tables. 26 ref. (L general, Al)

55-L. Cathode Efficiency as a Control Factor. J. B. Mohler. *Metal Finishing,* v. 52, Nov. 1954, p. 91-92.

Advantages of low-efficiency baths, control problems, measurements. Diagrams, graph. 2 ref. (L17)

56-L. Rapid Porous Chromium Plating. D. V. Pletnev and V. N. Brusentsova. *Henry Brutcher, Altadena, Calif., Translation no.* 2953, 8 p. (From *Vestnik Mashinostroeniya,* v. 32, no. 2, 1952, p. 37-40.)

Materials, equipment and methods. Table, micrographs. (L17)

57-L. Effect of Thiourea on the Electrodeposition of Copper. L. I. Antropov and S. Ya. Popov. *Henry Brutcher, Altadena, Calif., Translation no.* 3377, 8 p. (Condensed from *Zhurnal Prikladnoi Khimii,* v. 27, no. 1, 1954, p. 55-63.)

Previously abstracted from original. See item 524-L, 1954. (L17, Cu)

M

Metallography, Constitution and Primary Structures

1-M. Titanium-Manganese Phases. Harold Margolin and Elmars Ence. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1267-1268.

Tests on alloys between 31 and 70% manganese show that from four to six phases exist. Table, micrograph. 7 ref. (M24, Ti, Mn)

2-M. (French.) **Crystallographic Calculations for Cubic Metals.** Micheline Sternberg. *Métaux, Corrosion-Industries,* v. 29, no. 349, Sept. 1954, p. 335-346.

Crystallographic analysis of simple Laue diagram. Diagrams, photograph, tables. 2 ref. (M26)

3-M. (German.) **Experimental Studies on Contrast in the Electron Microscope.** W. Lippert. *Optik,* v. 11, no. 9, 1954, p. 412-421.

Differences in transmission factors of equally prepared foils and use of transmission-factor measurements for thickness determinations. Graphs, micrographs. 14 ref. (M21, S14, Al)

4-M. (Russian.) **Determination of the Number of Vacancies and of the Energy of Vacancy Formation in Metals and Alloys.** S. D. Gertsriken. *Doklady Akademii Nauk SSSR,* v. 98, no. 2, Sept. 11, 1954, p. 211-213.

Temperature and its effect on change in the length of specimen. Quenching from high temperatures fixes vacancies. Graphs, table. 10 ref. (M26, Ag, Al, Cu, Pt, Ir)

5-M. Electronic Structure of Primary Solid Solutions in Metals. J. Friedel. *Advances in Physics,* v. 3, Oct. 1954, p. 446-507.

Lattice structures, molecular orbitals. Diagrams, graphs, tables. 110 ref. (M26)

6-M. An X-Ray Diffraction and Vapor Pressure Investigation of the Rhenium-Germanium Phase Diagram. Alan W. Searcy, Robert A. McNees, Jr., and John M. Criscione. *American Chemical Society, Journal* v. 76, Nov. 5, 1954, p. 5287-5289.

One germanide ($ReGe_2$) was found and some of its properties determined. Table, graph, phase diagram. 8 ref. (M24, Re, Ge)

7-M. Coercive Force: Possible Measure of Degree of Malleablization. D. S. Eppelsheimer and D. S. Gould. *American Foundryman,* v. 26, Nov. 1954, p. 41-43.

Magnetic measurements agree with hardness and metallographic tests. Photographs, graphs, micrographs. 4 ref. (M23, P16, J23, CI)

8-M. Metals With Whiskers. Sydney M. Arnold. *Bell Laboratories Record,* v. 32, Nov. 1954, p. 417-420.

Conditions of growth on electronic components. Photographs, micrographs. (M26, Zn, Cd, Sn)

9-M. A Method of Examining Selected Areas of Surfaces Using Replicas and the Electron Microscope. G. R. Booker. *British Journal of Applied Physics,* v. 5, Oct. 1954, p. 349-350.

Use of wet-stripped replicas. Diagram, micrograph. 6 ref. (M21)

10-M. Formation of Metallic Compounds of Iron. (Digest of "Several Regularities in the Formation of Metallic Compounds of Iron", by I. I. Kornilov; *Doklady Akademii Nauk SSSR,* v. 91, 1953, p. 261-263.) *Metal Progress,* v. 66, Nov. 1954, p. 166, 168.

Effects of atomic size and position in the periodic system on formation of intermetallic compounds. (M26)

11-M. Some Experiences With a New Metallurgical Mounting Plastic. P. A. Lovett. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 201-203.

Experience with a cold-setting plastic. Photograph, micrographs. (M21)

12-M. Dislocations. A Review of Some Recent Books. M. A. Jaswon. *Research,* v. 7, Nov. 1954, p. 457-464.

Theory, strain energy, edge and screw dislocations and stress boundaries. Diagrams. 4 ref. (M26)

13-M. (German.) **The Crystal Structures of ZrSi and $ZrSi_2$.** H. Schachner, H. Nowotny and H. Kudielka. *Monatshefte für Chemie,* v. 85, no. 5, Oct. 15, 1954, p. 1140-1153.

X-ray studies. Tables, graph, diagram. 11 ref. (M26, Si, Fr)

14-M. (German.) **Effect of Oxygen on the Structure and Aging of Pure Iron.** Franz Wever, Wilhelm Anton Fischer and Helmut Engelbrecht. *Stahl und Eisen,* v. 74, no. 23, Nov. 4, 1954, p. 1521-1526.

Characteristics of molten iron, structure, notched bar toughness and hardness effects of oxygen and temperature. Photographs, graphs, micrographs. 10 ref. (M27, Q general, Fe)

15-M. (German.) **Oxide-Needle Meadows Grow on Metals.** G. Pfefferkorn. *Umschau in Wissenschaft und Technik,* v. 54, no. 21, Nov. 1, 1954, p. 654-655.

Phenomenon of whisker growth, nature and thermal conditions. Micrographs. 3 ref. (M26, N12, Cu, Fe)

16-M. (Hungarian.) **Nondestructive Metallographic Testing.** István Mester and Erik Fuchs. *Ontöde,* v. 5, no. 10, Oct. 1954, p. 218-227.

Nondestructive testing of metals with simple apparatus such as microscopes and cameras. Procedures and results. Photographs, diagrams, micrographs. 15 ref. (M21)

17-M. (Swedish.) **A Magnetic Balance for Ferromagnetic Materials.** Olle Hedebrant. *Jernkontorets Annaler,* v. 138, no. 10, 1954, p. 643-654.

Magnetic balance for study of transformations and transformation kinetics in alloys. Data for stainless steels. Photographs, diagrams, graphs, table. 5 ref. (M23, SS)

18-M. On the Determination of Nonmetallic Inclusions in Steel. Yu. T. Lukashevich-Duvanova. *Henry Brutcher, Altadena, Calif., Translation no.* 3394, 19 p. (Condensed from *Metallurg,* v. 11, no. 5, 1936, p. 19-33.)

Critical review of various methods of determining nature of nonmetallic inclusions in steel (electrolytic, chlorine, nitric acid residue methods). Tables, micrographs. 11 ref. (M28, M27, ST)

19-M. (Book.) **Dislocations in Metals.** Morris Cohen, editor. 200 p. 1954. American Institute of Mining and Metallurgical Engineers, Inc., 29 West 39th Street, New York, N. Y. $3.50.

Includes "The Nature of Dislocations in Ideal Single Crystals", J. S. Kolhler and F. Seitz; "Role of Dislocations in Crystal Growth and Grain Boundary Phenomena", W. T. Read, Jr. and W. Shockley; and "Dislocations and Mechanical Properties", E. Orowan. (M26, Q general)

N

Transformations and Resulting Structures

1-N. The Role of Inverse Segregation and Redistribution of Solute Atoms in the Freezing of Hypoeutectic Lead-Antimony Alloys. A. C. Simon and E. L. Jones. *Electrochemical Society, Journal,* v. 101, Nov. 1954, p. 536-545.

Causes of antimony segregation at faces of battery grid castings. Micrographs, diagram, graphs. 39 ref. (N12, Pb, Sb)

2-N. Diffusion of Hydrogen and Deuterium in High Purity Zirconium. Earl A. Gulbransen and Kenneth F. Andrew. *Electrochemical Society, Journal,* v. 101, Nov. 1954, p. 560-566.

Reactions are diffusion controlled. Experimental data fit theoretical explanations. Graphs, tables. 17 ref. (N1, Zr)

3-N. High Temperature Crystal Structure of Thorium. Premo Chiotti. *Electrochemical Society, Journal,* v. 101, Nov. 1954, p. 567-570.

X-ray diffraction patterns and electrical resistivity show transformation from face-centered to body-centered cubic at ± 1400° C. Carbon increases transformation temperature. Diagram, graphs, micrograph. 6 ref. (N6, Th)

4-N. Effect of Carbon Content on the 500° F. Embrittlement of Tempered Martensite. P. Payson. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1242-1243.

Decomposition of martensites containing 0.06, 0.13 and 0.25% carbon. Graphs. 5 ref. (N8, Q23, ST)

5-N. An Examination of the Decrease of Surface-Activity Method of Measuring Self-Diffusion Coefficients in Wustite and Cobaltous Oxide. R. E. Carter and F. D. Richardson. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1244-1257.

Radioisotopes used to show cobalt diffuses via vacant cation sites. Below 850° C. the surface activity method is not satisfactory for wustite. Tables, diagram, micrographs, photographs, graphs. 22 ref. (N1, Fe, Co)

6-N. Effect of Nitrogen on Sigma Formation in Cr-Ni Steels at 1200° F. (650° C.). G. F. Tisinai, J. K. Stanley and C. H. Samans. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1259-1267.

Nitrogen causes significant shifts of phase boundaries in the sigma region. Tables, micrographs, graphs. 7 ref. (N8, SS)

7-N. Stabilization of the Bainite Reaction. R. F. Hehemann and A. R. Troiano. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1272-1280.

Influence of partial high-temperature decomposition on reaction kinetics at lower temperatures for two alloy steels. Table, graphs, micrographs. 26 ref. (N8, AY)

8-N. Data for One of the Martensitic Transformations in an 11 Pct Mo-Ti Alloy. S. Weinig and E. S. Machlin. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1280-1281.

Experimental data on habit orientation, lattice relations, shear strain and orientation of subband markings. Tables, micrograph, diagram. 4 ref. (N9, Mo, Ti)

9-N. (French.) **Experimental Thermodynamic Study of the Platinum-Copper Superlattice.** Pierre Assayag and Maurice Dodé. *Comptes rendus,* v. 239, no. 13, Sept. 27, 1954, p. 762-764.

Oxidation equilibrium pressures of Pt-Cu alloys to prove existence of zones of composition for which the alloy is made up of two phases in equilibrium, and to determine with precision the composition of these phases. Graphs. 3 ref. (N10, Pt, Cu)

10-N. (German.) **Orientation Relationships and Growth in the Recrystallization of Aluminum.** Bernhard Liebmann. *Naturwissenschaften,* v. 41, no. 19, Oct. 1, 1954, p. 447-448.

Experimental study of relationship between recrystallization and deformation, and rate of crystal growth as a function of annealing time. Diagrams, graph. 3 ref. (N5, Al)

11-N. (Russian.) **The Showing of Intercrystallite Internal Adsorption in Aluminum Alloys by the Method of Microhardness.** V. I. Arkharov, I. P. Berenova and N. A. Kozina. *Doklady Akademii Nauk SSSR,* v. 98, no. 2, Sept. 11, 1954, p. 207-209.

Variation in microhardness according to grain size, aging and heat treatments. Graphs. 1 ref. (N7, Q29, Al)

12-N. The Solid Solution of Cadmium in Zinc. J. R. Brown. *Institute of Metals, Journal,* v. 83, Oct. 1954, p. 49-52.

Lattice parameter measurements of quenched alloys. Solubility of 1.83 wt.% is lower than previously reported. Tables, graphs. 7 ref. (N12, M26, Cd, Zn)

13-N. Growth Twins in Crystals of Low Co-Ordination Number. E. Billig. *Institute of Metals, Journal,* v. 83, Oct. 1954, p. 53-56 + 2 plates.

Studies on single crystals of germanium and silicon suggest a mechanism of twin formation. Diagram, table, graph, photographs. (N12, M27, Ge, Si)

14-N. The Bainitic Transformation of the Beta Phase in Copper-Zinc Alloys. R. D. Garwood. *Institute of Metals, Journal,* v. 83, Oct. 1954, p. 64-68 + 1 plate.

Studies on alloy with 41.3% zinc from 170 to 470° C. show mechanism is similar to bainitic transformation in steel. Graphs, tables, micrographs, diffraction pattern. 12 ref. (N9, Cu, Zn)

15-N. Diffusion of Nitrogen and Oxygen in Titanium. R. J. Wasilewski and G. L. Kehl. *Institute of Metals, Journal,* v. 83, Nov. 1954, p. 94-104 + 1 plate.

Tests in range 900 to 1570° C. show diffusion rate for nitrogen is independent of concentration while rates for oxygen decrease at higher concentrations. Graphs, micrographs. 22 ref. (N1, Ti)

16-N. Isothermal Transformations of Eutectoid Aluminium Bronzes. R. Haynes. *Institute of Metals, Journal,* v. 83, Nov. 1954, p. 105-114 + 1 plate.

Time-temperature-transformation diagrams for the range 350 to 560° C. Nickel has little effect on transformation rate. Tables, diagrams, graphs, micrographs. 23 ref. (N9, Cu, Al)

17-N. Conditions for Porosity Formation During Diffusion. R. W. Balluffi and L. L. Seigle. *Journal of Applied Physics,* v. 25, Nov. 1954, p. 1380-1382.

Formal relationships defining the regions of the diffusion zone where porosity tends to form during the Kirkendall effect. 9 ref. (N1)

18-N. Forming Point-Contact Silicon Transistors. Harold Jacobs, Frank A. Brand, Wesley Matthei and Alexander P. Ramsa. *Journal of Applied Physics,* v. 25, Nov. 1954, p. 1406-1412.

New technique in which a suitable impurity is arced at the surface of the silicon causing the impurity to be diffused into a small region. Diagrams, tables, graphs. (N1, Si)

19-N. Graphitization in Steel. A. M. Hall. *Materials & Methods,* v. 40, Nov. 1954, p. 96-99.

Nature of graphitization, effects on steel properties, mechanism of formation and its prevention. Micrographs, diagram, photographs, graph, table. 10 ref. (N8, ST)

20-N. Spheroidal Graphite Formation. E. Ward. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 155-158.

Various theories. Micrographs. 20 ref. (N8, CI)

21-N. Diffusion of Cadmium, Indium, and Tin in Single Crystals of Silver. C. T. Tomizuka and L. Slifkin. *Physical Review,* v. 96, ser. 2, Nov. 1, 1954, p. 610-615.

Diffusion coefficients of radioactive tracers were measured at 592 to 937° C. Graphs, tables. 15 ref. (N1, Ag, Cd, In, Sn)

22-N. Effect of Precipitation Hardening on the Superconducting Transition of an Aluminum Alloy. R. E. Mould and D. E. Mapother. *Physical Review,* v. 96, ser. 2, Nov. 1, 1954, p. 797-798.

Effect of heat treatment on aluminum and 63S aluminum alloy. 3 ref. Graphs. (N7, P15, Al)

23-N. (French.) **Contribution to the Study of Electrolytic Extraction of Carbides From High Speed Steel.** J. Papier. *Revue de métallurgie,* v. 51, no. 10, Oct. 1954, p. 723-734; disc., p. 734.

Amount and nature of carbides not dissolved after austenitizing at various temperatures and times. Tables, graphs, micrographs, diagram. (N8, TS)

24-N. (German.) **On the Diffusion Mechanism in Interstitial Solid Solutions.** Hermann Schumann. *Metallurgie und Giessereitechnik,* v. 4, no. 9, Sept. 1954, p. 385-388.

Geometry of place-change process and importance of diffusion rate of interstitial particles to the cloud theories, especially from the standpoint of embrittling of iron and steel. Tables, diagrams, graphs. 13 ref. (N1, Fe, CN)

25-N. (Russian.) **Accelerated Graphitization of White Cast Iron With Increased Chromium Content.** M. A. Krishtal. *Doklady Akademii Nauk SSSR,* v. 98, no. 4, Oct. 1, 1954, p. 583-584.

Relation between speed of graphitization and antimony content. Graph. 5 ref. (N8, CI)

26-N. (Russian.) **Liberation of Gases Dissolved in Metal.** D. P. Lovtsov. *Liteinoe Proizvodstvo,* 1954, no. 5, Aug., p. 24-25.

Experiments on aluminum alloys and silicon brass used to establish theory of solubility and evolution of gases by metals. Graph, diagrams, photographs. (N15, Al, Cu)

27-N. (Russian.) **Phenomenon of "Resorption" of the Diffusion Layer of Chromium-Plated Steel at High Temperatures.** G. N. Dubinin. *Vestnik Mashinostroeniia,* v. 34, no. 10, Oct. 1954, p. 84-87.

Tests on iron, carbon steel and stainless steels at 900 to 1100° C. under vacuum for 10, 30, 60 and 120 hr. (N1, ST)

28-N. (Swedish.) **Diffusion in Metallic Solid Solutions.** U. Landergren. *Jernkontorets Annaler,* v. 138, no. 10, 1954, p. 619-642.

Fick's law of diffusion, the Kirkendall effect, probable mechanism of diffusion in face-centered cubic metals. Graphs, diagrams. 65 ref. (N1)

29-N. Structure of Metals and Alloys After Vacuum Heating. L. I. Shushpanov. *Henry Brutcher, Altadena, Calif., Translation no.* 3304, 13 p. (From *Metallurg,* v. 12, no. 6, 1937, p. 31-36.)

Early Russian study of transformations occurring in plain carbon and low-alloy steels, copper and white iron within temperature range of 1100 to 2200° F. Diagram, micrographs. 6 ref. (N general, CN, AY, Cu, Al)

30-N. Metallographic Investigation of the Tempering of Quenched High-Carbon Steel. A. P. Gulyaev and M. P. Zel'bet. *Henry Brutcher, Altadena, Calif., Translation no.* 3390, 6 p. (From *Izvestiya Akademii Nauk SSSR,* 1954, no. 3, Mar., p. 83-87.)

Effect of tempering to 210, 390, 480, 570 and 930° F. upon microstructure and microhardness of specimens. Graphs, micrographs, tables. 3 ref. (N8, M27, Q29, CN)

31-N. (French.) **Micrographic Study at High Resolution of the First Stages of Aging of an Aluminum-Copper Alloy.** Raymond Castaing and Gabriel Lenoir. *Comptes rendus,* v. 239, no. 16, Oct. 18, 1954, p. 972-974.

Electron micrographs show characteristic heterogeneities. Micrographs. (N7, Al, Cu)

32-N. (French.) **Lines in High-Chromium Steels.** Berger. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 11, no. 11, 1954, p. 2106-2111.

Study of inclusions caused by solidification phenomena. Corrective measures are indicated. Table, graph, micrographs. (N12, AY)

33-N. (German.) **Structural Phenomena in the Segregation of Homogenized Aluminum-Zinc-Magnesium Alloys.** Paul Brenner and Margarete Schippers. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 577-583.

Determination of recrystallization and grain-boundary displacements after solution treatment; appearance of a substructure on segregation of the solid solution explained by polygonization and precipitation on subgrain boundaries. Table, graph, micrographs. 13 ref. (N7, N5, Al, Zn, Mg)

34-N. (German.) **X-Ray Investigations on the Age Hardening of an Aluminum-Copper Alloy With Small-Angle Oscillation Photography.** Volkmar Gerold. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 593-599.

Studies on 5% copper alloy aged for varying periods at room temperature to 220° C. indicate both room and high-temperature hardness zones. Graph, tables, diagram, diffractograms. 22 ref. (N7, Al, Cu)

35-N. (German.) **On the Structure of the States Arising From the Age Hardening of an Aluminum-Copper Alloy.** Volkmar Gerold. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 599-607.

Lattice models indicate a monoatomic layer of copper atoms parallel to (001); relationship of high-temperature age hardening to precipitation of theta" and theta-prime transition phases. Graphs, diagrams, tables, diffractograms. 18 ref. (N7, Al, Cu)

36-N. (Book—French.) **(Structural Modifications of Metallic Crystals and Their Influence on the Kinetics of Structural Hardening of Aluminum Solid Solutions.) Les modefications de structure du cristal metallique et leur influence sur la cinetique du durcissement structural des solutions solides d'aluminium.** Aurel Berghezan. 95 p. 1953. Magasin C.T.O.: Ave. de la Porte-d'Issy, Paris, France. 1200 fr.

Symmetrical irregularities and imperfections which are primarily responsible for mechanical and physical properties of metals. (N7, M26, Al)

P

Physical Properties and Test Methods

1-P. Magnetochemistry of the Heaviest Elements. VIII. Metallic Plutonium. J. K. Dawson. *Chemical Society, Journal,* 1954, Oct., p. 3393-3396.

Magnetic susceptibility of metallic plutonium measured up to 350° C. Indications of structure transitions were observed at 119, 205 and about 300° C. Tables, graphs. (P16, Pu)

2-P. Anodic Behavior of Copper in HCl. Lee Stephenson and J. H. Bartlett. *Electrochemical Society, Journal,* v. 101, Nov. 1954, p. 571-581.

Electrical and optical studies of current and voltage variations and their causes. Diagram, graphs, photographs, micrographs. 18 ref. (P15, Cu)

3-P. A Calorimetric Investigation of Heats of Formation and Precipitation in Some Cu-Sn Alloys. J. B. Cohen, J. S. L. Leach and M. B. Bever. *Journal of Metals,* v. 6; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1257-1258.

Test data for alloys containing 8.10 and 37.95% tin. (P12, Cu, Sn)

4-P. (French.) **Nickel Alloys Having a High Secondary Power of Emission.** Albert Bobenrieth, Jacques Millet and Stanislas Teszner. *Comptes rendus,* v. 239, no. 14, Oct. 4, 1954, p. 794-796.

Results of work on nickel-beryllium and nickel-magnesium alloys. Tables. 3 ref. (P17, Ni, Be, Mg)

5-P. (French.) **Magnetic Materials.** R. Vautier. *Métaux, Corrosion-Industries,* v. 29, no. 349, Sept. 1954, p. 347-360.

Magnetic properties and current ideas on elementary mechanisms of magnetization. Graphs, tables. 26 ref. (P16, SG-n)

6-P. (German.) **The Jordan Hysteresis in Ferromagnetic Sheet Metals.** Richard Feldtkeller and Günther Sorger. *Zeitschrift für angewandte Physik,* v. 6, no. 9, Sept. 1954, p. 390-396.

Measurement of complex permeability as function of frequency, field strength and temperature; explanation of the Jordan hysteresis by Neels theory on irreversible magnetic viscosity and by the Barkhausen effects. Table, graphs. 20 ref. (P16)

7-P. (Russian.) **Thermo-Electron Emission of Copper at the Melting Point.** V. G. Bol'shov and L. N. Dobretsov. *Doklady Akademii Nauk SSSR,* v. 98, no. 2, Sept. 11, 1954, p. 193-196.

Apparatus used, equations formulated and magnitude and sign of the temperature coefficient. Diagrams, graph, table. 4 ref. (P15, Cu)

8-P. **Coefficients of Thermal Expansion of Solids at Low Temperatures. I. The Thermal Expansion of Copper From 15 to 300° K.** Thor Rubin, Howard W. Altman, and Herrick L. Johnston. *American Chemical Society, Journal,* v. 76, Nov. 5, 1954, p. 5289-5293.

Apparatus for measuring thermal expansion of solids over the temperature range 15 to 300° K. by a differential method making use of a Fizeau interferometer. Experimental data for copper. Diagrams, tables, graphs. 15 ref. (P11, Cu)

9-P. **Thermal Expansion of Lithium, 77° to 300° K.** W. B. Pearson. *Canadian Journal of Physics,* v. 32, Nov. 1954, p. 708-713.

Measurements of lattice parameters, methods of low-temperature X-ray photography. Diagram, graph, table. 19 ref. (P11, Li)

10-P. **The Viscosity of Copper and Some Binary Copper Alloys.** W. R. D. Jones and W. L. Bartlett. *Institute of Metals, Journal,* v. 83, Oct. 1954, p. 59-63.

All viscosity-temperature curves show inflection near the liquidus. Diagram, graphs. 2 ref. (P10, Cu)

11-P. **Physical Chemistry of Steel. II. Experimental Evidence.** J. A. Kitchener. *Iron & Steel,* v. 27, Nov. 1954, p. 523-526.

Thermodynamics and structure of solutions in liquid iron. Table, graphs. 20 ref. (P12, N14, ST)

12-P. **Electron Emission From Metals Under High-Energy Ion Bombardment.** B. Aarset, R. W. Cloud and J. G. Trump. *Journal of Applied Physics,* v. 25, Nov. 1954, p. 1365-1368.

Electron emission from aluminum, gold, iron, magnesium, nickel and lead surfaces bombarded by atomic and molecular hydrogen ions. Diagram, table, graphs. 10 ref. (P15, Al, Au, Fe, Mg, Ni, Pb)

13-P. **An Estimation of Some Unknown Surface Tensions for Metals.** J. W. Taylor. *Metallurgia,* v. 50, no. 300, Oct. 1954, p. 161-165.

Calculations for 27 metals in cases where experimental data are lacking. Indirect experimental data substantiate estimated values. Tables, graphs. 26 ref. (P10)

14-P. **A Search for Natural Radioactivity in Neodymium, Rhenium and Osmium.** D. Dixon and A. McNair. *Philosophical Magazine,* v. 45, 7th ser., no. 370, Nov. 1954, p. 1099-1108.

Isotopes appear to have half-lives of the order of 10^{15} yr. Graphs, tables. 24 ref. (P13, Nd, Rh, Os)

15-P. **Statistics of the Occupation of Dislocation Acceptor Centres.** W. T. Read, Jr. *Philosophical Magazine,* v. 45, 7th ser., no. 370, Nov. 1954, p. 1119-1128.

Electrical effects of dislocations in germanium. Graphs. (P15, M26, Ge)

16-P. **Electrical and Optical Properties of Intermetallic Compounds. I. Indium Antimonide.** R. G. Breckenridge, R. F. Blunt, W. R. Hosler, H. P. R. Frederikse, J. H. Becker and W. Oshinsky. *Physical Review,* v. 96, ser. 2, Nov. 1, 1954, p. 571-575.

Measurement of electrical conductivity, Hall effect and optical absorption. Graphs, tables. 19 ref. (P15, P17, In, Sb)

17-P. (French.) **Study of Laminated Iron-Nickel Alloys Around the Curie Point by Means of Weak Alternating Fields.** André Marais. *Comptes rendus,* v. 239, no. 15, Oct. 11, 1954, p. 873-875.

Study of the ferromagnetism of iron-nickel alloys after one or several annealings in hydrogen above the Curie temperature. Graphs, table. 6 ref. (P16)

18-P. (French.) **Magnetic Properties of Some Rare Earth Metals and Oxides.** Charlotte Henry la Bilanchetais. *Journal des recherches du centre national de la recherche scientifique,* 1954, no. 28, Sept., p. 32-41.

Preparation of metallic cerium free of iron by a process of successive electrolyses of cerium salt. Preparation of cerium oxide and mixtures of rare earth oxides free of hydrates and carbonates. Magnetic properties at various temperatures. Diagrams. 24 ref. (P16, C23, Ce)

19-P. (German.) **Solubility of Several Transition Metals in Mercury.** J. F. de Wet and R. A. W. Haul. *Zeitschrift für anorganische und allgemeine Chemie,* v. 277, nos. 1-2, Sept. 1954, p. 96-112.

Preparation of the amalgams, spectrochemical, colorimetric and electron microscope studies, behavior of manganese and nickel. Tables, diagram, graph, micrograph. 30 ref. (P13, N12, Mn, Ni, Hg)

20-P. (Russian.) **The Hall Effect and the Variation in the Resistance of Lead, Copper, and Magnesium in a Magnetic Field.** E. S. Borovik. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* v. 27, no. 3 (9), Sept. 1954, p. 355-368.

Comparison of experimental data and theoretical calculations over the range 2 to 300° C. Graphs, tables, 31 ref. (P15, P16, Pb, Cu, Mg)

21-P. **R.F. Conductivity in Copper at 8MM Wavelengths.** J. S. Thorp. *Institution of Electrical Engineers, Proceedings,* v. 101, pt. 3, no. 74, Nov. 1954, p. 357-359.

Conductivity may be considerably reduced below the d.c. value by surface layers of low conductivity and by stress in the bulk material. Diagrams, tables, graphs. 7 ref. (P15, Cu)

22-P. **Physical Chemistry of Steel. III. Interaction Effects Between Solutes.** J. A. Kitchener. *Iron & Steel,* v. 27, Dec. 1954, p. 553-556.

Thermodynamics and structures of solutions in liquid iron. Interactions of carbon, sulfur, oxygen, silicon and nitrogen. Graphs. 22 ref. (To be concluded.) (P12, ST)

23-P. **Relationship Between Coercive Force of Soft Magnetic Materials and Thickness of Sheet.** V. A. Zaikova and Ya. S. Shur. *Henry Brutcher, Altadena, Calif., Translation no.* 3333, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 94, no. 4, 1954, p. 663-665.)

Previously abstracted from original. See item 311-P, 1954. (P16, Fe, Ni, Si)

24-P. **Contributions to the Data on Theoretical Metallurgy. XII. Heats and Free Energies of Formation of Inorganic Oxides.** James P. Coughlin. *U. S. Bureau of Mines Bulletin* 542, 1954, 80 p.

Data for evaluating heat balances in metallurgical processes, appraising improvements in extractive methods, and as a guide for developing better production methods. Tables. 169 ref. (P12)

25-P. **Change in the Physical Properties of Cold-Drawn Brass During Annealing.** G. I. Epifanov. *Henry Brutcher, Altadena, Calif., Translation no.* 3404, 11 p. (From *Zhurnal Tekhnicheskoi Fiziki,* v. 16, no. 12, 1946, p. 1475-1482.)

Previously abstracted from original. See item 18-212, 1947. (P15, J23, Cu)

26-P. (French.) **Some Magnetic Properties of the Alloy $MnAu_2$.** André J. P. Meyer and Pierre Taglang. *Comptes rendus,* v. 239, no. 16, Oct. 18, 1954, p. 961-963.

Variation of magnetization as a function of field strength and temperature. Graphs. (P16, Mn, Au)

27-P. (German.) **Property Changes During the Age Hardening of an Aluminum-Silicon Alloy.** Werner Köster and Willy Knorr. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 616-617.

Effect of annealing temperature and time on electrical, torsion, and hardness properties. Graphs. 4 ref. (P15, N7, J23, Q29, Al)

28-P. (Book.) **Properties of Surfaces.** Roy Waldo Miner, editor. v. 58, Annals of the New York Academy of Sciences. 250 p. 1954. New York Academy of Sciences, 2 East Sixty-Third St., New York 21, N. Y. $3.50.

Includes "The Life History of Adsorbed Atoms, Ions, and Molecules", Joseph A. Becker; "Absorbent-Adsorbate Interactions and Surface Heterogeneity in Physical Adsorption", J. M. Honig; "The Kinetics of Surface Properties", H. Austin Taylor; "The Effect of Monolayers on the Rate of Evaporation of Water", Robert J. Archer and Victor K. LaMer; "Classical Theory of Diffusion and the Oxidation of Metals", Earl A. Gulbransen; "Passivity and Adsorption", Herbert H. Uhlig; "Oxide Film Composition Studies", Thor N. Rhodin, Jr.; "Surface Studies With the Electron Microscope", C. J. Calbick; "The Adsorption of Dyes to Microcrystals of Silver Halide", W. West, B. H. Carroll, and D. L. Whitcomb; "Adsorption and Exchange in Metal-Metal Ion Systems", Cecil V. King; "The Adsorption of Gases and Vapors on Germanium", J. T. Law and E. E. Francois; "Electrical Conductivity of Germanium Surfaces", Edward N. Clarke; "Exploration of Metal Surfaces With Fine Wires", R. H. Savage and D. G. Flom; "Surface Properties of Germanium and Silicon", W. H. Brattain and C. G. B. Garrett; and "Stabilization of Metal Carbides by Nonmetallic Elements", Harry W. Podgurski. (P10, P15, N1, R2)

Q

Mechanical Properties and Test Methods; Deformation

1-Q. Some Metallographic Observations on the Fatigue Failure of 24S-T and Al-Clad 24S-T Alloy Sheet. J. J. Sebisty and J. O. Edwards. *Canada Department of Mines and Technical Surveys, Mines Branch Research Report* PM164, May 11, 1954, 45 p. + 14 plates.

Evaluation of crack damage, variation of deformation with stress level and fatigue data. Tables, diagrams, micrographs, graphs. 7 ref. (Q7, Al)

2-Q. Effect of Subcritical Cooling Rate on the Brittle-Fracture Characteristics of Structural Steel. L. Mair. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1206-1207.

Effects of cooling rate below 1200° F. after hot rolling on brittleness of 1020 steel plate. Table, graph. 2 ref. (Q26, Q23, CN)

3-Q. Strain Hardening of Latent Slip Systems in Zinc Crystals. E. H. Edwards and Jack Washburn. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1239-1242.

Anisotropic strain hardening occurred during simple shear due to formation of dislocation barriers. Diagram, photograph, graphs. 8 ref. (Q24, Zn)

4-Q. Mechanical Properties of Alpha Titanium as Affected by Structure and Composition. R. I. Jaffee, F. C. Holden and H. R. Ogden. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1282-1290.

Data for nitrogen and aluminum alloys. Increasing grain size decreases strength and hardness and increases impact resistance. Precipitation found in high-nitrogen alloys. Tables, micrographs, graphs. 11 ref. (Q23, Q29, Q6, N3, Ti)

5-Q. Temper Embrittlement of 5140 Steel. S. H. Bush and C. A. Siebert. *Journal of Metals,* v. 6, Nov. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Nov. 1954, p. 1269-1271.

Isothermal studies at various temperatures for times up to 3000 hr. Hardness, impact strength and structures were determined. Table, micrographs. 7 ref. (Q23, AY)

6-Q. High-Strength Steel. R. L. Brickley and D. M. S. Peckner. *Machine Design,* v. 26, Nov. 1954, p. 208-212.

Obtaining accurate mechanical property data provides simple method for statistical determination of actual yield-point variation. Tables, graph. 3 ref. (Q27, AY)

7-Q. Beams With Nonuniform Loading. F. C. Bragg. *Machine Design,* v. 26, Nov. 1954, p. 213-216.

Determination of reactions at beam supports. Tables, diagrams, graphs. (Q28)

8-Q. The Cause of Temper Brittleness in Steel. A. M. Sage. *Metal Treatment and Drop Forging,* v. 21, Oct. 1954, p. 463-468.

Assessment of present knowledge. Characteristics of elements causing or reducing susceptibility. Graphs, micrograph, tables. 16 ref. (Q23, ST)

9-Q. (Russian.) Influence of Alloying Additions on the Temperature Dependence of the Shear Modulus of Iron. N. S. Rysina and B. N. Finkel'shtein. *Doklady Akademii Nauk SSSR,* v. 98, no. 2, Sept. 11, 1954, p. 215-217.

Comparison of temperature-shear modulus curves for iron plus vanadium, molybdenum, cobalt and manganese, in the range of 20 to 760° C. Graph, table. 3 ref. (Q21, Fe)

10-Q. Twinned Crystals. R. W. Cahn. *Advances in Physics,* v. 3, Oct. 1954, p. 363-445.

Types and nature of twinning, growth and transformation twinning, deformation twinning. Diagrams, tables. 240 ref. (Q24)

11-Q. Energy Theorems and Structural Analysis. I. General Theory. J. H. Argyris. *Aircraft Engineering,* v. 26, Oct. 1954, p. 347-356.

Application of principles of virtual displacements and virtual forces. Diagrams, graphs. 13 ref. (To be continued.) (Q25)

12-Q. Tension Specimens Made by Photoengraving Technique. Ralph L. Dowdell and William B. F. Mackay. *ASTM Bulletin,* 1954, no. 201, Oct., p. 65-66.

Preparation of very thin and flat specimens. Photograph. 3 ref. (Q27)

13-Q. Recent Advances in Theories of Creep of Engineering Materials. Folke K. G. Odqvist. *Applied Mechanics Reviews,* v. 7, Dec. 1954, p. 517-519.

Refinements in theoretical treatment of primary creep. Graphs. 18 ref. (Q3)

14-Q. The Influence of Surface Rolling on the Fatigue Properties of Flake Graphite and Nodular Graphite Cast Irons. G. N. J. Gilbert and K. B. Palmer. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Oct. 1954, p. 447-464 + 2 plates.

Increases in fatigue limits of 20% for flake graphite and over 190% for nodular irons obtained on 45° V-notched specimens. Tables, micrographs, photographs, diagrams. 2 ref. (Q7, CI)

15-Q. Recent Research on Pressure Vessels. *Chemical Age,* v. 71, Nov. 13, 1954, p. 1031-1038.

Sources of weakness, types of failure. Recent research on strain measurement and design. Photographs, graphs. (Q25, CN)

16-Q. Stress Concentrations at Holes in Rotating Discs. H. G. Edmunds. *Engineer,* v. 198, Nov. 5, 1954, p. 618-620.

Results of tests made between 1947 and 1950, using the frozen stress technique, based on the photo-elastic investigation of Teverovsky in 1940. Graphs, stress patterns, photograph, diagram, table. (Q25)

17-Q. Three-Dimensional Stress Functions. H. L. Langhaar and M. Stippes. *Franklin Institute, Journal,* v. 258, Nov. 1954, p. 371-382.

Compatibility equations for an isotropic Hookean body subjected to boundary stresses and temperature gradients in terms of Maxwell stress functions; general solution for steady temperature fields. 6 ref. (Q25)

18-Q. Magnetic Measurement of Mechanical Hardness. D. Hadfield. *Institution of Electrical Engineers, Proceedings,* v. 101, pt. 2, no. 83, Oct. 1954, p. 529-535; disc., p. 535-540.

New method for the nondestructive measurement of the mechanical hardness of ferromagnetic components, based on the relationship between a "coefficient of magnetic hardness" and the variables in the upper portion of the magnetization curve. Graphs, tables, diagrams. 8 ref. (Q29, P16, ST)

19-Q. Influence of Cold Deformation on the Young's Modulus of Some Non-Ferrous Metals. Maurice Cook, T. Ll. Richards and G. F. Bidmead. *Institute of Metals, Journal,* v. 83, Oct. 1954, p. 41-47.

Young's modulus values for copper, brass and aluminum correlated with microstructures and X-ray data. Tables, graphs. 10 ref. (Q21, Cu, Al)

20-Q. Twinning and Untwinning in Polycrystalline Magnesium. R. L. Woolley. *Institute of Metals, Journal,* v. 83, Oct. 1954, p. 57-58 + 1 plate.

Stress-strain curves for repeated shear with strain amplitudes less than 10%. Graph, micrographs. (Q24, Mg)

21-Q. The Creep and Fatigue Properties of Some Wrought Complex Aluminium Bronzes. J. McKeown, D. N. Mends, E. S. Bale, and A. D. Michael. *Institute of Metals, Journal,* v. 83, Nov. 1954, p. 69-79 + 2 plates.

Tests at 300 to 400° C. indicate alloys with 3 to 7% aluminum are best. Corrosion-fatigue resistance is better than stainless steel. Graphs, tables, diagram, micrographs. 5 ref. (Q3, Q7, R1, Cu, Al)

22-Q. The Effect of Strain Rate and Temperature on the Resistance of Aluminium, Copper, and Steel to Compression. J. F. Alder and V. A. Phillips. *Institute of Metals, Journal,* v. 83, Nov. 1954, p. 80-86 + 1 plate.

Tests to 50% reduction of height at −190 to 550° C. for aluminum, from 18 to 900° C. for copper, and from 930 to 1200° C. for 0.17% carbon steel. Tables, graphs, diagram, photograph. 28 ref. (Q28, Al, Cu, CN)

23-Q. Strain-Ageing in 70:30 Brass. B. B. Hundy. *Institute of Metals, Journal,* v. 83, Nov. 1954, p. 115-116.

Observations during room temperature tensile tests at various testing rates and rest periods. Graphs. 6 ref. (Q23, Cu, Zn)

24-Q. Uses of Resistance Wire Type Strain Gages in Steel Plants. W. A. Black. *Iron and Steel Engineer,* v. 31, Nov. 1954, p. 57-63.

Stress and load analysis of mill equipment. Diagrams, photographs, graphs. (Q25)

25-Q. A Statistical Study of the Creep and Fatigue Properties of a Precision-Cast High-Temperature Alloy. G. T. Harris and H. C. Child. *Iron and Steel Institute, Journal,* v. 178, Nov. 1954, p. 284-290.

Mechanical properties at room temperature and 700 to 850° C. of a cobalt-nickel-chromium, iron alloy. Tables, graphs, photograph. 5 ref. (Q3, Q7, Co, Ni, Cr, Fe)

26-Q. On Structural Fatigue Under Random Loading. John W. Miles. *Journal of the Aeronautical Sciences,* v. 21, Nov. 1954, p. 753-762.

Problems of fluctuating loads induced by a jet, which result in possible fatigue failure of aircraft structural components, aided by the stress spectrum and "equivalent fatigue stress". Graphs, diagrams. 20 ref. (Q7)

27-Q. On Inelastic Thermal Stresses in Flight Structures. Alfred M. Freudenthal. *Journal of the Aeronautical Sciences,* v. 21, Nov. 1954, p. 772-778.

Effect of inelastic behavior on the level of thermal stresses with constant and temperature-dependent parameters and importance of design for such stresses. Graph. 10 ref. (Q25)

28-Q. Influence of Deuteron Bombardment and Strain Hardening on Notch Sensitivity of Mild Steel. Robert A. Meyer. *Journal of Applied Physics*, v. 25, Nov. 1954, p. 1369-1374.

Schnadt-type impact specimens of SAE 1019 steel irradiated with 18.6-m.e.v. deuterons. Table, graphs, diagram. 26 ref. (Q6, CN)

29-Q. Theory of Stress-Strain Relations in Anisotropic Visco-Elasticity and Relaxation Phenomena. M. A. Biot. *Journal of Applied Physics*, v. 25, Nov. 1954, p. 1385-1391.

Thermodynamic derivation given for the representation of a system having visco-elastic or relaxation properties by means of a potential and dissipation function. (Q21, Q27)

30-Q. A Theory of the Plastic Yielding Due to Bending of Cantilevers and Fixed-Ended Beams. I. A. P. Green. *Journal of the Mechanics and Physics of Solids*, v. 3, Oct. 1954, p. 1-15.

Effects of weak-end support and axial loading in addition to vertical loading on an isotropic plastic-rigid material. Diagrams, tables, graphs. 18 ref. (Q5)

31-Q. A Determination of Plastic Stress-Strain Relations. B. B. Hundy and A. P. Green. *Journal of the Mechanics and Physics of Solids*, v. 3, Oct. 1954, p. 16-21.

Plastic potentials of copper, zinc and stainless steel determined by notched tensile specimens. Diagrams, table, graph. 10 ref. (Q27, Cu, Zn, SS)

32-Q. The Dynamic Straining of Metals Having Definite Yield Points. D. B. C. Taylor. *Journal of the Mechanics and Physics of Solids*, v. 3, Oct. 1954, p. 38-46.

Analysis of strain rate during nonuniform yielding. Equation for dynamic yield criterion. Graphs, table. 7 ref. (Q27, ST)

33-Q. The Yield of Mild Steel Under Impact Loading. J. D. Campbell. *Journal of the Mechanics and Physics of Solids*, v. 3, Oct. 1954, p. 54-62.

Dynamic stress-strain curve indicates yield stresses are about double static values. Diagram, graphs. 11 ref. (Q6, CN)

34-Q. An Experimental Study of Biaxial Stress-Strain Relations in Plasticity. P. M. Naghdi and J. C. Rowley. *Journal of the Mechanics and Physics of Solids*, v. 3, Oct. 1954, p. 63-80.

Data for ten tubular 24S-T4 specimens. Photographs, diagram, graphs. 16 ref. (Q27, Al)

35-Q. Finite Plane Strain for Orthotropic Bodies. A. E. Green and E. W. Wilkes. *Journal of Rational Mechanics and Analysis*, v. 3, Nov. 1954, p. 713-723.

Flexure of a cuboid solved in terms of a general strain energy function. 5 ref. (Q27)

36-Q. Two New Aluminum Extrusion Alloys. *Materials & Methods*, v. 40, Nov. 1954, p. 90-91.

Mechanical properties and design strength comparisons. Tables, photograph. (Q general, Al)

37-Q. Pickling Chromium for Ductility. W. J. Kroll. *Metal Industry*, v. 85, Oct. 22, 1954, p. 345-346.

Review of work on ductility of chromium. Graph. 8 ref. (Q23, L12, Cr)

38-Q. Low-Alloy Ferritic Steels Checked for Turbine Wheel Service. (Digest of "High-Temperature Properties of Four Low-Alloy Steels for Jet-Engine Turbine Wheels", by Arthur Zonder, Adron I. Rush and James W. Freeman; *WADC Technical Report* 53-277, Part I, Nov. 1953, 66 p.) *Metal Progress*, v. 66, Nov. 1954, p. 202, 204.

Data on tensile, rupture and total deformation properties at 1000 and 1100 and 1200° F. for four steels—SAE 4340, "17-22A"S, H-40 and C-422. (Q27, Q4, Q24, AY, SG-h)

39-Q. Ship Structural Members. VI. J. McCallum. *North East Coast Institution of Engineers & Shipbuilders, Transactions*, v. 71, Nov. 1954, p. 25-49.

Stress analysis of plates stiffened by flat bars. Diagrams, graphs. 6 ref. (Q25)

40-Q. Secondary Stresses in Buried High Pressure Pipe Lines. M. G. Spangler. *Petroleum Engineer (Management Edition)*, v. 26, Nov. 1954, p. D6-D10, D12.

Primary sources are backfill and traffic loads. Stress magnitude in combination with stresses caused by internal fluid pressure. Diagrams, graphs, tables. 5 ref. (Q25)

41-Q. Damping Capacity of Materials. Alexander Yorgiadis. *Product Engineering*, v. 25, Nov. 1954, p. 164-170.

Analysis and evaluation of phenomenon in nonuniformly and uniformly stressed members. Graphs, diagrams, tables. 8 ref. (Q8)

42-Q. Scoring Characteristics of Bearing Metals. A. E. Roach. *Product Engineering*, v. 25, Nov. 1954, p. 171-175.

Results of survey covering relative score resistance of 38 bearing materials when run against steel; ratings to simplify choice of metal for given bearing use. Photographs, diagram, table. (Q9, T7, SG-m)

43-Q. The Optimum Design of Compression Surfaces Having Unflanged Integral Stiffeners. E. J. Catchpole. *Royal Aeronautical Society, Journal*, v. 58, Nov. 1954, p. 765-768.

Rapid determination of the optimum cross-sectional dimensions. Diagrams, graphs. 8 ref. (Q28)

44-Q. The Dynamic Lateral Instability of Beams. J. F. Davidson. *Royal Society, Proceedings*, v. 226, ser. A, Oct. 21, 1954, p. 111-128.

Analysis of the vibrations of a deep slender beam, bent to uniform curvature by invariant moments acting in a vertical plane which is also the plane of maximum stiffness. Graphs, tables. 11 ref. (Q23)

45-Q. Cast Ferrous Metals. II. What Physicals Can You Expect? III. What Are Their Performance Limits? T. E. Eagan. *Steel*, v. 135, Nov. 22, 1954, p. 112-114; Nov. 29, 1954, p. 80-82.

Factors influencing mechanical properties of iron and steel castings. (Q general, CI)

46-Q. Crack Propagation. Frederick Forscher. *Welding Journal*, v. 33, Nov. 1954, p. 579S-584S.

A modified Griffith's crack mechanism used to analyze reported data. A material property called "fracture toughness" is of major importance. Diagrams, photographs, graph. 16 ref. (Q26)

47-Q. (Czech.) **Mechanical and Physical Properties of Titanium-Stabilized Austenitic Chromium-Nickel Steel Castings.** Zdenek Eminger, Antonin Fiala and Jaroslav Slajs. *Hutnické Listy*, v. 9, no. 9, 1954, p. 514-523.

Effects of titanium on intercrystalline corrosion, mechanical properties and magnetization. Diagrams, graphs, tables, photograph. 11 ref. (Q general, P16, R1, SS)

48-Q. (Czech.) **Examination of Internal Stresses With X-Rays.** Petr Skulari. *Hutnické Listy*, v. 9, no. 9, 1954, p. 529-537.

Origin of internal stresses, X-ray techniques. Diagrams, diffractograms. 29 ref. (Q25)

49-Q. (French.) **Refractory Cast Steels.** *Fonderie*, 1954, no. 105, Oct., p. 4192-4196.

Corrosion resistance and high-temperature mechanical strength of pearlitic, ferritic and austenitic grades. Graphs, table. (Q23, R general, CI, SS)

50-Q. (French.) **Young's Modulus of Aluminum and Its Alloys as a Function of Temperature.** E. G. Stanford. *Revue de métallurgie*, v. 51, no. 10, Oct. 1954, p. 674-678; disc., p. 678.

Variation of damping capacity with temperature and its use in study of recrystallization. Diagrams, graphs. (Q21, Q8, N5, Al)

51-Q. (French.) **Plasticity of Hexagonal Metals and Its Variation With Temperature.** S. F. Pugh. *Revue de métallurgie*, v. 51, no. 10, Oct. 1954, p. 683-692.

Plasticity is related to elastic constants. Changes in mode of deformation with temperature are related to relaxation processes. Graph, table, diagrams. 37 ref. (Q23, Zn, Cd, Mg, Ti, Zr, Hf, Be, U)

52-Q. (German.) **Aging Phenomena of Steam Boilers.** V. Jares. *Energietechnik*, v. 4, no. 9, Sept. 1954, p. 412-413.

Causes of embrittling. Proposed prevention includes operating the boiler below 13 atmospheres or the use of aging-resistant sheet steel. Graphs. 2 ref. (Q23, N7, T25, CN)

53-Q. (German.) **Correlation Between Fracture Appearance and the Steep Slope of the Notched Bar Toughness-Temperature Curve of Soft Steels.** Heinz Kornfeld. *Stahl und Eisen*, v. 74, no. 23, Nov. 4, 1954, p. 1526-1536.

Statistical analysis of data for openhearth fine-grain and rimming steels, and Armco iron from −60 to 40° C. Tables, graphs, photographs. 5 ref. (Q6, CN, Fe)

54-Q. (German.) **A New Flow Analogy of Torsion.** E. Pestel. *Zeitschrift für angewandte Mathematik und Mechanik*, v. 34, nos. 8-9, Aug.-Sept. 1954, p. 322-323.

Mathematical relationship between behavior of a viscous liquid and the torsional behavior of a primatic bar. Diagram. (Q1)

55-Q. (German.) **Substitution of the Stress on the Edge of a Perforation of an Elliptically Perforated Disk by Stressing the Unperforated Disk.** G. Sonntag. *Zeitschrift für angewandte Mathematik und Mechanik*, v. 34, nos. 8-9, Aug.-Sept. 1954, p. 330-331.

Mathematical example of a relationship which may be an aid to new solutions in the plain elasticity theory. Diagrams. 2 ref. (Q21)

56-Q. (Hungarian.) **Fatigue Studies of Aluminum Alloys and of Welded Seams.** Istvan Varga. *Kohaszati Lapok*, v. 9, no. 10, Oct. 10, 1954, p. 474-480.

Tests on Al-Cu-Mg, Al-Mg-Si, Al-3% Mg and Al-5% Mg alloys in air, river water, motor oil and ethyl benzene. Diagrams, graphs, photographs. (Q7, Al, Mg, Cu, Si)

57-Q. (Italian.) **Influence of Hardening and Recrystallization on the Elastic Constants of Aluminum.** F. Gatto. *Alluminio*, v. 23, no. 5, Oct. 1954, p. 503-513.

Electro-acoustic tests permit study of structural changes for various hardening treatments. Graphs, diagrams, photograph, tables. 13 ref. (Q21, J27, Al)

58-Q. (Russian.) **Influence of Boron on the Properties of Austenitic Chromium-Nickel Steel of the Kh15N25 Type (15 Cr, 25 Ni).** N. S. Kreshchanovskii, V. I. Prosvirin and E. S. Ginzburg. *Liteinoe Proizvodstvo*, 1954, no. 5, Aug., p. 16-19.

Influence of boron additions (0.02 to 1.0%) on crystalline structure, amount of carbides, rate of aging, impact strength and hardness of cast and forged Kh15N25 steel. Tables, graphs, micrographs, photographs. 7 ref.
(Q29, Q6, M26, N7, AY, SS)

59-Q. (Russian.) **Improvement of Mechanical Properties of Cast Steel When the Lost-Wax Method Is Used.** N. S. Kreshchanovskii, M. L. Khenkin, and M. N. Zimmering. *Liteinoe Proizvodstvo,* 1954, no. 7, Oct., p. 20-24.

Experimental investigation of influence of cerium addition on the mechanical properties of 35L, U10A, ShKh15, Kh15N15, EI257 and Kh12 steels. Tables, graphs, micrographs. 3 ref. (Q general, E15, CI)

60-Q. (Russian.) **Relationship Between Wear Resistance of Metals Under Friction Against an Abrasive Surface and Their Hardness.** M. M. Khruschov and M. A. Babichev. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 3-9.

Method of investigation and diagrams of hardness (Vickers or microhardness) versus wear resistance for pure metals, various carbon steels and cold hardened metals. Diagrams, table. 4 ref.
(Q29, Q9, CN)

61-Q. (Russian.) **Problem of Application of Radioactive Isotopes for Study of Wear of Machine Parts.** P. E. D'iachenko. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 9-14.

General discussion, with particular attention to machine parts that are not easily accessible to ordinary investigation, such as piston rings. Graphs, diagrams. (Q9)

62-Q. (Russian.) **Comparison of Conditions of Fatigue Strength.** I. A. Birger. *Vestnik Mashinostroeniia,* v. 34, no. 9, Sept. 1954, p. 14-20.

Treats mathematically the fatigue-strength patterns of plastic metals for the important practical case where only normal and tangential stresses are acting. Graphs. 7 ref. (Q7)

63-Q. (Russian.) **Influence of Mechanical Treatment on Wear Resistance of Steel Parts of Machinery.** A. A. Matalin. *Vestnik Mashinostroeniia,* v. 34, no. 10, Oct. 1954, p. 57-62.

Influence of residual stresses and surface finish on wear resistance. Diagrams. 5 ref. (Q25, Q9, ST)

64-Q. (Russian.) **Quality of Surface and Fatigue Strength.** D. D. Papshev. *Vestnik Mashinostroeniia,* v. 34, no. 10, Oct. 1954, p. 64-68.

Influence of surface finish on fatigue strength. Relates surface characteristics to cutting cycles and geometric parameters of cutting edges. Diagrams, table. 11 ref. (Q7)

65-Q. Stresses in Short Beams. I. Experimental Analysis. J. S. Caswell. *Engineering,* v. 178, Nov. 12, 1954, p. 625-628.

Compares theoretical estimate of the maximum shear stresses with an experimental estimate obtained by photoelastic analysis. Graphs, fringe patterns, diagram. 2 ref. (Q2)

66-Q. Mechanisms of Creep in a Precipitation Hardened Alloy. G. C. E. Olds. *Physical Society, Proceedings,* v. 67, no. 419B, Nov. 1954, p. 832-842 + 1 plate.

Studies of a 97% copper, 3% silver alloy. Diagrams, graphs, tables. 16 ref. (Q3, J27, Cu, Ag)

67-Q. The Slip Modes of Titanium and the Effect of Purity on Their Occurrence During Tensile Deformation of Single Crystals. A. T. Churchman. *Royal Society, Proceedings,* v. 226, ser. A, Nov. 9, 1954, p. 216-226.

Modes of slip were identified as (1010) [1120], (1011) [1120] and (0001) [1120]. Tables, photograph, diagrams. 16 ref. (Q24, Ti)

68-Q. Tests of Extruded Magnesium Cargo Flooring for Aircraft. J. A. Liska. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1550-I, Oct. 1954, 11 p. + 38 plates.

Load tests on floor panels of various designs. Tables, diagrams, photographs, graphs. (Q28, T24, Mg)

69-Q. Shearing-Stress Measurements by Use of a Heated Element. H. W. Liepmann and G. T. Skinner. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3268, Nov. 1954, 27 p.

Use of small elements embedded in the surface of a solid to obtain local skin-friction coefficients. Graphs, diagrams. 9 ref. (Q2)

70-Q. Investigation of Static Strength and Creep Behavior of an Aluminum-Alloy Multiweb Box Beam at Elevated Temperatures. Eldon E. Mathauser. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3310, Nov. 1954, 21 p.

Tests on beams made of 24S-T3. Lifetime can be satisfactorily predicted from stress-rupture data. Tables, diagrams, photographs, graphs. 14 ref. (Q3, Q4, Al)

71-Q. Fatigue of Metals—Notched Bodies. Results of Tests Conducted at Swiss Federal Institute for Testing Materials in 1948-50. M. Ros. *Henry Brutcher, Altadena, Calif., Translation no.* 2959, 9 p. (From *Revue de Métallurgie,* v. 48, no. 10, 1951, p. 723-733.)

Previously abstracted from original. See item 69-Q, 1952. (Q7)

72-Q. Influence of Manganese Upon the Mechanical Properties of Welds and on Their Susceptibility to Hot Cracking. E. D. Lonskii. *Henry Brutcher, Altadena, Calif., Translation no.* 3007, 5 p. (From *Avtogennoe Delo,* v. 23, no. 10, 1952, p. 5-7.)

Previously abstracted from original. See item 772-Q, 1953.
(Q general, K9, Mn)

73-Q. Formation and Breakdown of Welding Bridges Between Friction Surfaces. M. P. Levitskii. *Henry Brutcher, Altadena, Calif., Translation no.* 3403, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 92, no. 4, 1953, p. 797-798.)

Previously abstracted from original. See item 322-Q, 1954. (Q9, M25)

74-Q. (English.) **New Approach to the Theory of Residual Stresses in Welds.** Folke K. G. Odqvist. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning,* v. 25, no. 6, 1954, p. 259-263.

Origin and time history of residual stresses. Graphs, diagrams. 6 ref. (Q25, K general)

75-Q. (French.) **Influence of Copper in Steel.** Blanchard. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 11, no. 11, 1954, p. 2135-2141.

Effects on mechanical properties, corrosion resistance and surface defects that occur during rolling and forging. 5 ref.
(Q general, R general, F22, F23, Cu, AY)

76-Q. (French.) **Creep Properties of "Oneral", a Cast Refractory Alloy.** J. Poulignier and H. Bibring. *Recherche Aéronautique,* 1954, no. 41, Sept.-Oct., p. 47-51.

Characteristics of alloy which has cobalt-chromium base, containing Mo, Ni, Ti, Zr and C. Graphs, photographs. (Q3, SG-h)

77-Q. (German.) **Dispersion and Symmetry of the Texture of Sheet Metals Investigated on the Example of Aluminum Foils.** Johanna Grewen and Günter Wassermann. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 570-576.

Texture determination of aluminum foil by the counting tube process. Table, graph, pole figures. 14 ref. (Q24, Al)

78-Q. (German.) **Rolling and Recrystallization Textures of Aluminum. Texture Investigations on Hot Rolled Sheet Aluminum.** Wolfgang Bunk, Kurt Lücke and Georg Masing. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 584-593.

Effect of rolling and heat treating on the texture of thin and heavy sheet aluminum. Table, pole figures. 11 ref. (Q24, Al)

79-Q. (German.) **Creep Tests on Aluminum Monocrystals at Successively Increased Loads.** Martin Bauser and Ulrich Dehlinger. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 618-621.

Experimental equipment and procedure for measuring very small elongations. Diagram, graphs, table. 5 ref. (Q3, Al)

80-Q. (Book.) **Behavior of Metals Under Impulsive Loads.** John S. Rinehart and John Pearson. 256 p. 1954. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $5.50.

Concept of impulsive loading, properties of materials, methods of observation, equipment, deformation, and structural changes. (Q general)

81-Q. (Book.) **Fatigue.** Thomas J. Dolan, B. J. Lazan, and Oscar J. Horger. 121 p. 1954. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $3.00.

Basic concepts of fatigue damage, fatigue failure under resonant vibration conditions, and fatigue characteristics of large sections. (Q7)

82-Q. (Book.) **Fatigue Tests on Rolled Alloy Steels Made in Electric and Open-Hearth Furnaces.** P. H. Frith. Special Report No. 50, British Iron and Steel Research Association. 130 p. + 22 plates. 1954. The Iron and Steel Institute, 4 Grosvenor Gardens, London S.W.I., England £1/0/8.

Ratios of reversed bending and reversed torsional fatigue strengths for steels heat treated to various strengths. Effects of production method and inclusions. (Q7, AY)

83-Q. (Pamphlet.) **The Ductile Fracture of Metals: Mechanical Anisotropy in SAE 4340 Steel.** Office of Naval Research. Report no. PB 111423. 29 p. 1953. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. $1.00.

Tests on vacuum melted, aircraft quality, and commercial steels indicate that inclusions are not principal source of microcracks. (Q26, AY)

R
Corrosion

1-R. The Oxidation of Copper and Zinc. E. R. S. Winter. *Chemical Society, Journal,* 1954, Oct., p. 3342-3344.

Studies of oxidation mechanism in terms of defect structures.
(R2, Cu, Zn)

2-R. Galvanic Anodes Control Induced Voltages on Pipe Lines. E. H. Thalmann. *Corrosion,* v. 10, Nov. 1954, p. 367.

Problem requiring good ground-to-pipeline contact. Diagram. (R10)

3-R. Corrosion of Refinery Equipment by Sulfuric Acid and Sulfuric Acid Sludges. V. J. Groth and Raymond J. Hafsten. *Corrosion,* v. 10, Nov. 1954, p. 368-389; disc., p. 389-390.

Failures, prevention and control. Photographs, tables, graphs. 8 ref. (R5, R6)

4-R. Corrosion Resistance of Cupronickel Alloys Containing 10 to 30 Percent Nickel. Frank L. LaQue. *Corrosion,* v. 10, Nov. 1954, p. 391-399; disc., p. 399.

Application of alloys to corrosive industrial environments. Photographs, graphs, tables. 19 ref. (R general, T general, Ni, Cu)

5-R. Extrinsic Line Current Fluctuations Seriously Restrict Progress of Coating Conductance Surveys on Large Trunk Line. G. I. Russell and L. B. Nelson. *Corrosion,* v. 10, Nov. 1954, p. 400.

Anomalous currents in Trans-Mountain's 24-in. wrapped oil line. 3 ref. (R1, CN)

6-R. Internal Corrosion in Domestic Fuel Oil Tanks. R. Wieland and R. S. Treseder. *Corrosion,* v. 10, Nov. 1954, p. 401-406; disc., p. 406.

Residual water is chief offender, coatings failure second. Alkaline $NaNO_2$ inhibits effectively. Photographs, tables, graphs. 2 ref. (R7, R10, CN)

7-R. Inhibitor Evaluation by the Pearson Null Bridge. Barton L. Cross and Norman Hackerman. *Corrosion,* v. 10, Nov. 1954, p. 407-412.

Device measures change in ohmic resistance rather than potential change. Only about 70% correlation is established with other methods. Circuit diagram, graphs. 14 ref. (R10)

8-R. Sulfide Corrosion Cracking of Oil Production Equipment. *Corrosion,* v. 10, Nov. 1954, p. 413-419; disc., p. 419.

Progress report by Technical Unit Committee 1-G of NACE describes latest field studies and preventive measures. Photographs, tables. 5 ref. (R7, ST)

9-R. Maybe Cathodic Protection's the Answer to Your Problem of External Well-Casing Corrosion. Yale W. Titterington. *Oil and Gas Journal,* v. 53, Nov. 8, 1954, p. 178-179.

Method of determining current requirements agrees with down-the-hole surveys. Diagram, graphs. (R10)

10-R. (German.) **Contribution to the Knowledge on the Corrosion of Commercial Iron.** Anton Königer. *Giesserei,* v. 41, no. 21, Oct. 14, 1954, p. 565-569; disc., p. 569-570.

Mechanism of corrosion in the presence of hydrogen ions; hydrogen-depolarizing effect of graphite; and corrosion-inhibiting effect of ionic oxygen. Effect of the cast skin, alloying components and previous treatment on its resistance to corrosion. Diagrams, photographs, graphs. 11 ref. (R general, CI)

11-R. A Potentiostat for Corrosion Study. M. H. Roberts. *British Journal of Applied Physics,* v. 5, Oct. 1954, p. 351-352.

Design and performance of instrument for studying relationship between electrode potential and corrosion rate. Diagrams. 3 ref. (R11)

12-R. Corrosion Problems in Hospital Practice. S. J. Hopkins. *Corrosion Technology,* v. 1, Nov. 1954, p. 330-332, 343.

Types of corrosion and inhibitors for surgical equipment. Photographs. 3 ref. (R general, R10, ST)

13-R. Detecting Corrosion in Chemical Plant. Horace Manley. *Corrosion Technology,* v. 1, Nov. 1954, p. 333-335.

Importance of early remedial action, use of ultrasonic inspection for detection of corrosion. Photographs. (R general, S13, ST)

14-R. Corrosion in the Motor-Car. II. The Cooling System. Z. S. Michalewicz. *Corrosion Technology,* v. 1, Nov. 1954, p. 337-339.

Causes and prevention. Photographs. 7 ref. (R general, Cu, CI, ST, Al, Sn)

15-R. A Survey of Corrosion Inhibitors. A. Bukowiecki. *Engineers' Digest,* v. 15, Oct. 1954, p. 425-427. (From *Schweizer Archiv,* v. 20, no. 6, June 1954, p. 169-186.)

Previously abstracted from original. See item 361-R, 1954. (R10)

16-R. Corrosion by and Deterioration of Glycol and Gycol-Amine Solutions. W. G. Lloyd and F. C. Taylor, Jr. *Industrial and Engineering Chemistry,* v. 46, Nov. 1954, p. 2407-2416.

Clarifications of chemical factors affecting corrosion by aqueous glycol solutions and to indicate some means of controlling plant corrosion. Tables, graphs, diagrams. 30 ref. (R7)

17-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 46, Nov. 1954, p. 75A-76A, 78A.

Duriron shows good performance as anodes for cathodic protection with impressed currents. Photographs. (R10, CI)

18-R. The Application of Cathodic Protection to Chemical Plant. F. D. Murphy. *Industrial Chemist and Chemical Manufacturer,* v. 30, Oct. 1954, p. 483-487.

Compares economics of cathodic and coatings protection. Diagrams, graphs, photograph. 4 ref. (R10)

19-R. Problems of Boiler Water Treatment at Medium and High Pressures. C. W. Drane. *Institute of Fuel, Journal,* v. 27, Oct. 1954, p. 502-509.

Survey of requirements of feed water and boiler water conditioning for plants; boiler water reactions; caustic cracking; problems of high-pressure operation; boiler corrosion. Diagrams, graphs. 28 ref. (R4, R10)

20-R. The Selective Oxidation of Nickel-Chromium Alloys at High Temperatures. J. Moreau and J. Bénard. *Institute of Metals, Journal,* v. 83, Nov. 1954, p. 87-93; disc., p. 93 + 3 plates.

Tests at 800 to 1250° C. in a hydrogen + water vapor atmosphere on a 4.6% chromium alloy showed oxide structure differs markedly from structure of the metal surface. Mechanism of oxide formation. Graph, micrographs, table, diagrams. 8 ref. (R2, Ni, Cr)

21-R. Corrosion Resistance of Titanium in Hydrochloric Acid and Sulfuric Acid. Warren W. Harple. *Materials & Methods,* v. 40, Nov. 1954, p. 106-108.

Curves for concentration vs. rate at various temperatures. Graphs, table. (R5, Ti)

22-R. Sacrificial Anodes at Work. T. R. B. Watson. *Modern Metals,* v. 10, Nov. 1954, p. 82-84.

Savings gained by application of magnesium anodes for protection of various steel installations. Diagrams. (R10, ST, Mg)

23-R. Corrosion of Nickel Cast Irons in Soils. *National Bureau of Standards, Technical News Bulletin,* v. 38, Nov. 1954, p. 160-161.

Evaluation of effects of varying amounts of nickel in castings with respect to weight losses and pitting, corrosion mechanics, hydraulic bursting pressure measurement and residual strength. Table, photograph. 2 ref. (R8, Q23, CI)

24-R. How to Control Vapor-Zone Corrosion in Sour-Crude Tanks. A. H. Newberg and J. P. Barrett. *Oil and Gas Journal,* v. 53, Nov. 15, 1954, p. 189-190, 192.

Control by design, use of resistant materials inhibitors, or coatings. Diagram, micrographs. 1 ref. (R7, R10, L general, CN)

25-R. Corrosion in the Petroleum Industry. I. F. H. Garner and A. R. Hale. *Petroleum,* v. 17, Nov. 1954, p. 407-410.

Corrosion and its mitigation in heaters, fractionators, reactors and condensers. Photographs. (To be continued.) (R7)

26-R. Seawater as an Industrial Coolant. II. Equipment Experience. W. B. Brooks. *Petroleum Refiner,* v. 33, Nov. 1954, p. 179-182.

Dow's experience at Freeport, Texas, on corrosion problems. Photographs. (R4)

27-R. (German.) **Cathodic Protection of Pipe Lines. I. Principles and Process of Cathodic Protection Against Corrosion.** H. Steinrath. *Erdöl und Kohle,* v. 7, no. 10, Oct. 1954, p. 647-650.

Minimum and maximum protective current for a given type, size and soil condition. Effects of stray anodic or cathodic currents. Tables, graph, diagram. 30 ref. (R10, R8)

28-R. (German.) **Temporary Anti-Corrosion Measures.** Erich Rabald. *Werkstoffe und Korrosion,* v. 5, no. 10, Oct. 1954, p. 368-392 + 1 plate.

Survey of common practices. Special atmospheres, removable coatings, tests for coatings. Tables, graphs, photographs, diagram. 250 ref. (R10, L general)

29-R. (German.) **The Corrosion of Metals and Metallic Coatings in Tropical and Subtropical Climates.** Willi Machu. *Werkstoffe und Korrosion,* v. 5, no. 10, Oct. 1954, p. 395-398.

Extreme temperature changes, condensation and traces of salt are main problems. 1 ref. (R3)

30-R. (Hungarian.) **Criticism of Potentiometric Measuring as a Research Method for Corrosion.** *Magyar Kémikusok Lapja,* v. 9, no. 10, Oct. 25, 1954, p. 310-314.

Evaluation of method on basis of literature and Hungarian investigations. Electrode potential of corroding metal; factors affecting the electrode potential. 20 ref. (R10)

31-R. Further Tests on the Stability of Analytical Weights in Chemical Laboratories. P. H. Bigg and F. H. Burch. *British Journal of Applied Physics,* v. 5, Nov. 1954, p. 382-386.

Changes in various kinds of weights caused by the corrosive atmospheres of chemical laboratories. Tables. 6 ref. (R3)

32-R. Corrosion Inhibitor Checklist. Maxey Brooke. *Chemical Engineering,* v. 61, Dec. 1954, p. 230, 232, 234.

Table recommends appropriate inhibitor for use with corrosive liquids in contact with representative metals and alloys. Table. 77 ref. (R10)

33-R. Internally-Clad Aluminum Combats Tube Bundle Corrosion. David Stewart and Gordon Weyermuller. *Chemical Processing,* v. 17, Dec. 1954, p. 52-54.

Three refinery problems—their solution and results. Photographs. (R general, Al)

34-R. Cathodic Protection System Eliminates Tank Bottom Failures. Robert Spraul, W. A. Buckner and Gordon Weyermuller. *Chemical Processing,* v. 17, Dec. 1954, p. 62-64.

Rectifier system guards against

loss of product and promotes safety. Photographs. (R10, CN)

35-R. Principles of Corrosion. I. Why Metals Corrode. W. H. J. Vernon. *Corrosion Prevention and Control,* v. 1, Nov. 1954, p. 533-538, 546.

Basic principles explained for the nonspecialist. Diagrams, table, graph. (R1)

36-R. The B.N.F. Jet-Test on Organic Bright Nickel Deposits. J. Edwards. *Institute of Metal Finishing, Bulletin,* v. 4, Spring 1954, p. 33-46.

Limitations of method, calibration techniques. Tables, graphs. (R11, L17, Ni)

37-R. Field Investigation of Corrosion in Alkaline Pulping Equipment. C. B. Christiansen and J. B. Lathrop. *Pulp & Paper,* v. 55, Nov. 1954, p. 113-119.

Studies of corrosion variables and remedial measures. Diagrams, graphs. 2 ref. (R5)

38-R. Influence of Exposed Area on Stress-Corrosion Cracking of 24S Aluminum Alloy. William H. Colner and Howard T. Francis. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3292, Nov. 1954, 22 p.

Study of "area effect" for 24S alloy and effects of stress level, degree of sensitivity and hydrogen peroxide concentration. Table, photographs, graphs, diagram, micrographs. 2 ref. (R1, Al)

39-R. (German.) **On the Oxidation of the Intermetallic Compound AlSb by Water.** Werner Rudorff and Ernst Justus Kohlmeyer. *Zeitschrift für Metallkunde,* v. 45, no. 10, Oct. 1954, p. 608-612.

Mechanisms of reactions, reduction of the suboxide. Graphs, tables, micrographs. 8 ref. (R2, Al, Sb)

40-R. (Book.) **Deterioration of Materials. Causes and Preventive Techniques.** Glenn A. Greathouse and Carl J. Wessel, editors. 835 p. 1954. Reinhold Publishing Corp., 430 Park Ave., New York, N. Y. $12.00.

Atmospheric, chemical, and biological deterioration of metals, wood, paper, textiles, plastics, rubber, coatings, and electronic, optical, and photographic equipment. (R general)

41-R. (Book.) **Water Conditioning for Industry.** Sheppard T. Powell. 548 p. 1954. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y.

Water treatment including filtration and purification procedures. Corrosion inhibitors. Embrittlement of boiler steel. (R10, Q23)

S

Inspection and Control

1-S. The B.I.S.R.A. Profiloscope. A. E. Ranger. *Wire Industry,* v. 21, Oct. 1954, p. 1015-1018, 1021.

Instructions for use and interpretation of images obtained with instrument for checking wire drawing dies. Photographs, diagrams. (S14, F28)

2-S. Radiographic Properties of X-Rays in the Two to Six-Million-Volt Range. Charles H. Goldie, Kenneth A. Wright, John H. Anson, Robert W. Cloud and John G. Trump. *ASTM Bulletin,* 1954, no. 201, Oct., p. 49-54.

Theory and equipment for examining thick metal pieces. Graphs, tables. 9 ref. (S13)

3-S. Special Instruments for the Steel Industry. W. A. Black. *Instruments and Automation,* v. 27, Nov. 1954, p. 1786-1791.

Ultrasonic inspection and thickness gaging, X-ray thickness gaging, blooming-mill torque control, open-hearth crane analyses and electrical weighing. Development of special depth and crack indicators. Photographs, diagrams, graph. (S general, ST)

4-S. Instrumentation of Modern By-Product Coke Ovens. E. T. W. Bailey. *Instruments and Automation,* v. 27, Nov. 1954, p. 1815-1817.

Control system, utilizing pneumatic techniques, for fuel-gas pressures, stack draft, exhausters and boosters. Photographs, diagrams. (S18)

5-S. Calibration of a Nickel-Molybdenum Thermocouple. Richard D. Potter. *Journal of Applied Physics,* v. 25, Nov. 1954, p. 1383-1384.

Values of e.m.f. were determined up to 2242° F. Graph, table. 4 ref. (S16)

6-S. How to Check Accuracy of Ultrasonic Flaw Detection. Nicholas Grossman. *Materials & Methods,* v. 40, Nov. 1954, p. 100-101.

Method of setting ultrasonic equipment to detect flaws above a specified minimum size. Photographs, tables, diagram. (S13)

7-S. Radiographic Inspection Assures Sound Pipeline Welds. Harold Hovland. *Oil and Gas Journal,* v. 53, Nov. 15, 1954, p. 223-225, 228, 230.

Advantages, weld control, operator qualifications, radiographic costs. Photographs, tables. 2 ref. (S13)

8-S. ABC's of Ultrasonic Inspection. E. F. Weller, Jr. *Steel Processing,* v. 40, Nov. 1954, p. 706-714.

Principles, equipment, and applications. Diagrams, photographs. 11 ref. (S13, S14, S15)

9-S. Industrial Applications of Atomic Energy. Alfonso Tammaro. *Steel Processing,* v. 40, Nov. 1954, p. 715-722.

Uses of radioisotopes in various industrial and research problems. Principles of various reactors. Diagrams, photographs. (S19, T25)

10-S. (French.) **Industrial Testing by Ultrasonics.** *Métallurgie et la construction mécanique,* v. 86, no. 9, Sept. 1954, p. 653, 655, 657.

Methods and advantages. Drawings. (To be continued.) (S13, S14, S15)

11-S. (German.) **Luster and Luster Impression.** H. D. Schulz-Methke. *Metalloberfläche,* Ausgabe A, v. 8, no. 11, Nov. 1954, p. 161-164.

Methods of determining structure and luster of metal surfaces, importance of objective methods of measuring luster. Diagram. 17 ref. (S15, P17)

12-S. Hardness Tester Sorts Auto Engine Parts. Milton J. Diamond. *Electronics,* v. 27, Dec. 1954, p. 160-161.

Automatic sorter measures hardness of steel rocker arms for automobile engines. Nondestructive test using magnetic retentivity provides 100% inspection. Photographs, circuits. (S10, Q29, ST)

13-S. Instrumentation in the Iron and Steel Industry. B. O. Smith. *Metal Treatment and Drop Forging,* v. 21, Nov. 1954, p. 499-502.

New industrial and research equipment. Diagrams. 6 ref. (S general, ST)

14-S. X-Ray Techniques and High-Speed Recording. J. Savage and D. S. Box. *Metal Treatment and Drop Forging,* v. 21, Nov. 1954, p. 503-505.

Application of principles of general physics. Diagram, graph. 3 ref. (S general)

15-S. Ultrasonic Inspection by the Through-Transmission and Pulse-Reflection Methods. H. Krainer and E. Krainer. *Henry Brutcher, Altadena, Calif., Translation no. 3378,* (Abridged from *Archiv für das Eisenhüttenwesen,* v. 24, no. 5-6, 1953, p. 229-236.)

Previously abstracted from original. See item 311-S, 1953. (S13)

16-S. Quick and Precise Routine Determination of the Thickness of Steel Sheet from One Side. Friedrich Förster. *Henry Brutcher, Altadena, Calif., Translation no.* 3387, 12 p. (From Report No. 26, Institut Dr. Förster, Reutlingen (Germany), 1953, 15-page Typescript.)

Description and performance of instrument. Graphs, diagrams, photographs. 6 ref. (S14, ST)

T

Applications of Metals in Equipment

1-T. High Alloy Castings in Heat Treating Resist High Temperature Conditions. *Industrial Heating,* v. 21, Oct. 1954, p. 1999 + 4 pages.

Successful industrial applications of three basic groups of heat resistant alloy castings and examples to show how they provide various combinations of mechanical properties and hot gas corrosion resistance. Photographs. (T5, R9, J general, CI)

2-T. Carbide Tools for Non-Cutting Uses. J. Witthoff. *Metal Treatment and Drop Forging,* v. 21, Oct. 1954, p. 456-462.

Advantages of using sintered carbides for dies, punches and other forming tools. Photographs, tables. (T6, H15, C-n)

3-T. Some Tests on the Stability of 25-20 Stainless Steel for Analytical Weights. E. R. Harrison. Commonwealth of Australia, Dept. of Supply, Defence Standards Laboratories Technical Note 18, Dec. 1953, 7 p.

Stability and corrosion resistance are satisfactory. Table, graphs. 5 ref. (T8, SS)

4-T. Large Diameter Aluminium Tubes in Structures. Cedric Marsh. *Engineer,* v. 198, Oct. 29, 1954, p. 584-586.

Use of tubes formed from sheet as a structural medium, economic and design reasoning for its application. Diagrams, graphs. (T26, Al)

5-T. Stiffened-Panel Construction With Light Alloys. *Engineering,* v. 178, Oct. 29, 1954, p. 570-571.

Fabrication and welding methods of transport units. Photographs, diagrams. (T21, K general, EG-a)

6-T. Pressure Vessel Design. New Alloys for Multi-Layer Vessels. G. E. Fratcher. *Petroleum Refiner,* v. 33, Nov. 1954, p. 137-141.

Development and construction of low-alloy vessels and their testing. Graphs, tables. (T25)

7-T. A Look Ahead in Vessel Design. E. W. Jacobson. *Petroleum Refiner,* v. 33, Nov. 1954, p. 148-155.

Corrosion, brittle fracture, high-temperature creep, graphitization and hydrogen penetration. Photographs, diagrams, tables, graphs. 18 ref. (T26, R general, Q26, Q3, N8)

8-T. Knotty Materials Problems for Structural Efficiency Posed by Jet Age Speed Boost. Spencer L. Shaw. *Western Metals,* v. 12, Nov. 1954, p. 59-61.

Problems posed by aerodynamic heating in future aircraft. Diagrams, graphs, tables. (T24)

9-T. (Russian.) **Improvement in Bearings Lined With Lead Bronze.** Iu. Ia. Zil'berg. *Vestnik Mashinostroeniia,* v. 34, no. 10, Oct. 1954, p. 28-30.

Application of protective layer of lead-tin-antimony alloy (2.5% Sb, 1.5% Sn, 96.0% Pb) in thicknesses from 20 to 55 microns, to the lead-bronze lining of bushings for heavy-duty diesel tractor bearings. Diagrams, photograph, photomicro- (SS, SG-g, h)

10-T. The Use of Semiconductors in Thermoelectric Refrigeration. H. J. Goldsmid and R. W. Douglas. *British Journal of Applied Physics,* v. 5, Nov. 1954, p. 386-390.

Theory, development of thermocouple consisting of bismuth telluride, Bi_2Te_3 and bismuth, capable of maintaining 26° C. of cooling. Graphs, diagrams. 13 ref. (T27, S16, Bi, Te)

11-T. The Aluminum Body of the New Dyna-Panhard Automobile. J. J. Baron. *Henry Brutcher, Altadena, Calif., Translation no.* 3381, 24 p. (From *Aluminium,* v. 30, no. 5, 1954, p. 183-194.)

Previously abstracted from original. See item 221-T, 1954. (T21, Al)

12-T. (Book.) **Handbook of Aeronautics, No. 2. Component Design.** 4th Ed. 207 p. 1954. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker St., Kingsway, London, W.C. 2, England. Pitman Publishing Corp., 2 West 45th St., New York. $7.50.

Aircraft structures. Rivets and riveting techniques. Air conditioning and pressurization. Control systems. Fuel systems. (T24, K13)

13-T. (Book.) **The Science of Dental Materials.** Eugene W. Skinner. 4th Rev. Ed. 456 p. 1954. W. B. Saunders Co., Philadelphia, Pa. $7.50.

Physical materials; plaster and dental stone; prosthetic materials; denture resins; nonmetallic materials; porcelain and silicate cement; self-curing resins; amalgam; casting procedures; gold and chromium alloys. (T10, Cr, Au)

V

Materials

General Coverage of Specific Materials

1-V. (Dutch.) **Copper and Copper Alloys. XIV. Special Brass.** W. G. R. de Jager. *Metalen,* v. 9, no. 19, Oct. 15, 1954, p. 310-313.

Tables of dimensions and mechanical properties of the commercially available types of brass products. 14 ref. (To be continued.) (S22, Cu)

2-V. (German.) **High-Melting Metals and Their Alloys as Raw Materials for the Construction of Apparatus.** F. Benesovsky and K. Sedlatschek. *Chemie-Ingenieur-Technik,* v. 26, no. 10, Oct. 1954, p. 538-543.

Production, processing and behavior toward all types of corrosion and specific fields of applications. Tables. 14 ref. (T general, Ti, Zr, Hf, Ta, Nb, V, Cr, Mo, W)

3-V. (German.) **Titanium.** A. von Zeerleder, A. Koller and E. Koelliker. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 20, no. 9, Sept. 1954, p. 273-290.

Literature review on the history, sources, production, metallurgy and properties of titanium and its alloys; survey of present status and future prospects of titanium. Tables, charts, photograph, diagrams, graphs. 55 ref. (Ti)

4-V. (German.) **Hardenable Copper Alloys.** Rudolph Reinbach. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 7, no. 10, Oct. 1954, p. 441-446.

Importance of the hardenable alloys; the principle of the hardening process; heat treating for hardness; and properties and uses of hardenable Cu-Be, Cu-Cr, Cu-Mn-Ni and Cu-Ni-Si alloys. Graphs, micrographs, table, photographs. 6 ref. (Si, Cu, Be, Cr, Mn, Ni)

5-V. New Metals for Nuclear Technology. William A. Johnson. *American Society of Naval Engineers, Journal,* v. 66, Nov. 1954, p. 887-896.

Brief review of properties and applications of beryllium, zirconium, and uranium. (T25, Be, Zn, U)

6-V. High-Strength Weldable Steel. W. E. Bardgett and L. Reeve. *Iron & Steel,* v. 27, Nov. 1954, p. 514-518.

Mechanical properties, machinability, corrosion resistance and applications. Tables, graphs, diagram, photographs. 3 ref. (AY)

7-V. Rare-Earths in Metallurgy. H. Evans. *Metal Industry,* v. 85, Oct. 29, 1954, p. 365-367, 374.

Occurrence, extraction and applications, effects of additions to various alloys. Tables, graphs, micrographs. 10 ref. (EG-g)

8-V. Titanium in Jet Engines. D. C. Goldberg. *Modern Metals,* v. 10, Nov. 1954, p. 46, 48, 50, 52.

Production, alloy systems, fabrication problems, mechanical properties and required research. Diagram, photographs, tables, graph. (T25, Ti)

9-V. Recent Developments in Cast Iron. S. B. Bailey. *Times Science Review,* 1954, Winter, p. 6, 8.

Development, properties and applications of gray, malleable and nodular cast irons. Photographs. (CI)

10-V. (German.) **Production of Titanium and Its Application.** Joachim Hedderich. *Metallurgie und Giessereitechnik,* v. 4, no. 9, Sept. 1954, p. 389-394.

Review of literature on production methods, properties, and uses of titanium and its alloys. Diagrams, tables, graph. 36 ref. (Ti)

11-V. Naval Brass. Corrosion Resistant Brass. *Alloy Digest,* no. Cu-21, Dec. 1954.

Composition, physical constants, mechanical properties, machinability and weldability. (Cu)

12-V. Elektron-MCZ. Creep Resistant Magnesium Casting Alloy. *Alloy Digest,* no. Mg-14, Dec. 1954.

Composition, physical constants, mechanical properties, machinability, joining, corrosion resistance and surface treatment. (Mg)

13-V. K-42-B. Precipitation Hardening Heat Resistant Alloy. *Alloy Digest,* no. Ni-13, Dec. 1954.

Composition, physical constants, mechanical properties, heat treatment, machinability and general characteristics. (Ni, Fe, SG-h)

14-V. Hastelloy Alloy X. Heat and Oxidation-Resistant Alloy. *Alloy Digest,* no. Ni-14, Dec. 1954.

Composition, physical and mechanical properties, workability and machinability. (Ni, SS, SG-h)

15-V. Nitralloy 135 Modified. Nitriding Steel. *Alloy Digest,* no. SA-24, Dec. 1954.

Composition, physical constants, mechanical properties, machinability, weldability and corrosion resistance. (AY)

16-V. Duraloy HU. Heat & Corrosion Resistant Steel. *Alloy Digest,* no. SS-21, Dec. 1954.

Composition, physical constants, mechanical properties, heat treatment, machinability, corrosion resistance and general characteristics. (SS, SG-g, SG-h)

17-V. USS 5. Corrosion and Heat Resisting Steel. *Alloy Digest,* no. SS-22, Dec. 1954.

Composition, physical constants, mechanical properties, heat treatment and weldability. (SS, SG-g, h)

18-V. Vulcan Non-Shrinkable. Non-Deforming Tool Steel. *Alloy Digest,* no. TS-28, Dec. 1954.

Composition, mechanical properties, heat treatment and machinability. (TS)

19-V. Modern Trends in Hollow Drill Steel. B. M. Hamilton. *Canadian Mining and Metallurgical Bulletin,* v. 47, no. 511, Nov. 1954, p. 748-755; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 57, 1954, p. 486-493.

Development and properties of alloy toolsteels for making rock drills. Graphs, tables, photographs. (T28, TS)

20-V. Material, Treatment and Design for Drill Rods. T. E. Norman. *Mining Congress Journal,* v. 40, Nov. 1954, p. 31-34, 101.

Mechanical properties, heat and surface treatments, and corrosion fatigue properties of carbon and alloy steels for drill rods. Tables, graphs, photographs, micrographs. (T28, ST)

21-V. Graphitic Tool Steels in the Press Room. Lester F. Spencer. *Tool Engineer,* v. 33, Dec. 1954, p. 97-101.

Structures, properties and advantages for forming tools. Photograph, micrographs, tables, graphs. 4 ref. (T6, T5, TS)

22-V. Nitrogen-Alloyed High Speed Steel. V. I. Prosvirin and I. R. Ushevskii. *Henry Brutcher, Altadena, Calif., Translation no.* 2931, 18 p. (From "Nitrogen in Steel", Azot v Stali, 1950, p. 140-160.)

Study of experimental steels for influence of nitrogen on austenite grain size, quantity of retained austenite, secondary hardness, martensite transformation during tempering and cutting performance. Tables, micrographs, graphs. (M27, Q29, N8, J29, G17, TS)

23-V. (Pamphlet.) **Titanium Bibliography.** Report CTR-306. 26 p. Office of Technical Services, U. S. Department of Commerce, Room 6227, Washington 25, D. C. $0.50.

More than 300 research reports are described and priced. Complete instructions for ordering accompany each entry. Special listings are featured for titanium alloys, titanium carbides, titanium nitrides, and the various titanium oxides. Research covers all characteristics of the metal, mechanical, chemical, and physical. (Ti)

24-V. (Book.) **Handbook on Titanium Metal.** 7th Rev. Ed. 93 p. 1953. Titanium Metals Corp. of America, 233 Broadway, New York 7, N. Y.

Methods of production, physical and mechanical properties, corrosion resistance, fabricating practices. (Ti)

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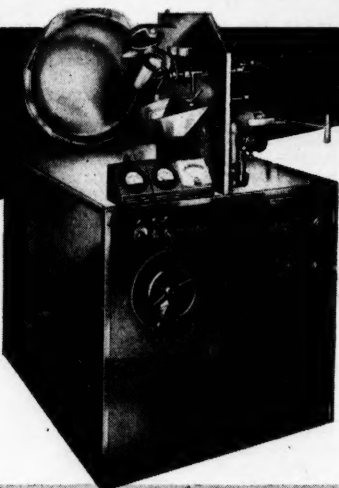

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POSITIONS OPEN

Midwest

METALLURGICAL/CHEMICAL ENGINEER: Graduate wanted to assist melting department metallurgist in steel mill making high speed, tool, stainless, specialty steels and high-temperature alloys. In reply give details of education, experience, age, references, etc. Box 1-10.

METALLURGIST: Graduate with several years experience for process development in steel mill making high-temperature alloys, high speed, tool, stainless and specialty steels. Duties would involve development of processing procedures for new alloys as well as improvement of processes for established alloys under direction of process development metallurgist. Write details of education, experience, age, reference, etc. Box 1-15.

METALLURGIST: For laboratory work in steel mill making high-temperature alloys, high speed, tool, stainless and specialty steels. Work will include metallurgical examination of materials, writing reports, conducting investigations of mill problems involving large variety of alloys. Good opportunity for graduate with one to three years experience. In reply state education, experience, age, references, etc. Box 1-20.

RESEARCH ASSISTANTS: Part-time, to conduct sponsored research, with opportunity for graduate study in metallurgical engineering. Stipends $1400 to $5000 yearly, depending on qualifications and time spent on research. Write: Metallurgical Engineering Department of Illinois Institute of Technology, Technology Center, Chicago 16, Ill.

LIBRARIAN: Assistant, male, with faculty status as instructor. Background in engineering or science, plus library degree. Starting salary dependent on experience. University engineering library, month's vacation, usual state benefits. Reply to: Prof. LeRoy Zweifel, Librarian, College of Engineering, University of Wisconsin, Madison 6, Wis.

PRODUCTION METALLURGIST: $8360 per annum, to serve as consultant to engineers on metallurgical problems, including heat treatment, plating, inorganic finishes, and procedural or material specifications for ammunition items. Interested persons should submit SF 57 (Application for Federal Employment) to Ordnance Ammunition Command, Joliet, Ill., attention: Civilian Personnel Officer.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering with one to three years experience, emphasis on process control operations. Powdered metallurgy background. Salary commensurate with experience and ability. Submit full details in first letter, all replies confidential. Write: Personnel Department, Fansteel Metallurgical Corp., 2200 Sheridan Rd., North Chicago, Ill.

METALLURGIST: Experienced in continuous casting, to establish pilot plant and small production unit for copper alloys. Salary open with chance for investment in new company located in Pennsylvania. Box 1-30.

METALLURGICAL SUPERVISOR: Age 28 to 32, for central research laboratory of nationally prominent automotive parts manufacturer engaged in studies in applied metallurgical research and development in automotive field. Wide range of problems essentially in ferrous alloys. Challenging position in highly competitive industry. Prefer man with advanced degree. Excellent opportunity for advancement. Salary open. Box 1-35.

METALLURGIST: With not more than two or three years industrial experience, to work on metallurgical development projects associated with a diversified line of automobile parts. Excellent opportunity for advancement, salary open. Box 1-40.

ENGINEERING GRADUATES: Opportunity with small steel plant. Recent metallurgical graduates preferred for steel plant observation plant. Good starting salary and opportunity to work into supervision. Box 1-45.

SALES ENGINEER: To resident of Cleveland (25 to 30) with engineering degree. Opportunity to assist in sales with small manufacturer's agent firm handling engineered items for materials handling, heat treating and corrosion resistance. Require top-notch man of good appearance and background. Some travel in Ohio requiring car. Salary plus bonus. Box 1-50.

SALES ENGINEER: Young aggressive manufacturer of combustion and heat transfer equipment utilizing successful new design principles requires full-time sales representative for growing business in the Cleveland area. Mechanical, metallurgical or chemical engineering degree required. Age 25-40, salary and bonus arrangement. Send resume to: L. C. Peskin, President, Thermal Research and Engineering Corp., Conshohocken, Pa.

East

GRADUATE FELLOWSHIPS: In physical metallurgy at Eastern university. Stipend to $2400 per academic year plus free tuition. Academic and experimental work leading to M.S. or Ph.D. degree. Possibility of summer employment. Available July or September 1955. Box 1-55.

SALES DEVELOPMENT ENGINEER: New company wants graduate engineer with experience using ferrous metals in machinery. He can quickly achieve a responsible position. Will manage salt bath installation and use, to treat ferrous metals for better lubricity; also development of uses. Extensive traveling necessary. Box 1-60.

METALLURGIST: With aptitude for research and development in field of high alloy steels. Prefer man with laboratory experience, possessing sound background in physical metallurgy, capable of writing clear, concise reports. Opportunities for professional development through publications and association with recognized authorities. In reply indicate training, experience, military status and salary requirements. Box 1-65.

RESEARCH METALLURGISTS: To assist in technical administration, planning and coordination of one of nation's major research programs. Opportunity for travel and for part-time research. Ph.D. or equivalent research and/or administrative experience desired. Salary commensurate with experience and education. Address inquiries to: Office of Naval Research, Civilian Personnel and Services Division, Navy Department, Washington 25, D. C.

METALLURGICAL AND MECHANICAL ENGINEERS: Work involves all experimental fabrication operations for metallic fuel elements of interest to the A.E.C., such as rolling, swaging, forging, extruding, etc. Specific familiarity with these operations is not necessary, although an interest in mechanical and metallurgical factors is required. All problems are attacked both theoretically and practically. Experience required is very flexible ranging from recent college graduate to a man with several years experience in metalworking or related fields. Original thinking and ability to carry several experimental projects with little supervision as well as ability to work under considerable pressure with frequent changes in program are important. Location near Boston, Mass. Box 1-70.

PHYSICAL METALLURGISTS, METALLURGICAL ENGINEERS AND PHYSICISTS: For research and development work in high-temperature alloys, cermets, titanium, molybdenum and vacuum techniques. Graduates with or without experience. Apply stating age, educational background, experience, salary requirements. All replies confidential. Box 1-75.

METALLURGIST: Opening for young metallurgical graduate in established firm manufacturing stainless steel tubing. Laboratory work, production problems, customer contact, some travel. New Jersey area. Forward resume and salary desired. Box 1-80.

ENGINEER: Mechanical—metallurgical, preferably with rolling mill background, for process and quality control. Key position with excellent growth possibilities in New York City. Box 1-160.

RESEARCH FELLOWSHIP: Available July 1, 1955. Stipend $3000. Research on welding metallurgy to be conducted in metallurgy department of well-known eastern university. Candidate for Ph.D. may carry full schedule toward degree. Applications must be received before Apr. 1, 1955. Box 1-165.

West

METALLURGIST: Experienced in light metals to operate aluminum melting and billet casting department in Texas extrusion plant. Send complete resume. All replies confidential. Box 1-85.

ELECTROCHEMIST OR CHEMICAL ENGINEER: Individual wanted for position with excellent government research laboratory in Southern California. Applicant must have experience in electroplating, electroforming, surface treatment of metals, and corrosion, and must be effective technical report writer. Interested persons are requested to file Application for Federal Employment, Standard Form 57, to: Box 1-90.

METALLURGISTS: Senior or intermediate level with aircraft or similar experience. Should have background in materials and processes, nondestructive testing, failure analysis or specification writing. Write: Convair, Employment Office, P.O. Box 1011, Pomona, Calif.

METALLURGIST: Individual wanted for position with excellent government research laboratory in Southern California to conduct investigations on metals for application to ordnance components. Applicant must be effective technical report writer. Interested persons are requested to file Application for Federal Employment, Standard Form 57 to Box 1-95.

METALLURGICAL ENGINEER: Engineering administration position involving development and evaluation of corrosion resistant ferrous alloys, fabrication techniques, and welding standards primarily for chemical plant applications. Experience is required in the manufacture or fabrication of stainless steel, with applied work in welding methods and techniques. Starting salary $7040 to $8360. Write: Hanford Operations Office, U. S. Atomic Energy Commission, Richland, Wash.

POSITIONS WANTED

METALLURGIST: M.S. degree, December 1953. Age 27, veteran. Two and one-half years diversified experience in industrial laboratories and research work including one year of corrosion research with stainless steel castings. Future field of work undecided. Willing to travel. Will consider position outside of United States. Box 1-100.

METALLURGICAL ENGINEER: B.S. degree, age 32, family. Nine years diversified experience in heat treating, material specification and metal finishing. Desires responsible position with progressive West Coast firm or branch office. Will consider technical sales and service work. Box 1-105.

SALES DEVELOPMENT ENGINEER: Graduate metallurgical engineer, age 34, family, with 12 years diversified and responsible ferrous and nonferrous experience in research, production, sales and administration. Desires technical sales or contact position representing western metal producer, processor or warehouse. Professional engineer. Possesses drive, personality, appearance and ability to meet competitive market. Box 1-110.

PHYSICAL METALLURGIST: Age 60, heat transfer specialist, rolling, forging, extrusion and liquid forming experiences, manufacture of allied equipment. Desires connection with basic research for atomic equilibrium. Box 1-115.

METALLURGICAL ENGINEER: B.S. degree in metallurgical engineering from University of Illinois in February 1955. Desires product development or production in Chicago area. Experienced as machine shop helper, punch press operator, mechanical press assembler, metallographer and observer in open-hearth. Age 22, married. Box 1-120.

METALLURGIST — DIRECTOR OF RESEARCH—SALES ENGINEER: With 20 years experience in all phases of manufacture and fabrication of stainless and alloy steels. Outstanding record of achievement. Proven administrative ability, consultant and technical writer. Presently employed as chief metallurgist. Desires to relocate. Interested in challenging and responsible position. Box 1-125.

MANUFACTURING EXECUTIVE: Graduate engineer, heavy accounting, all phases of metal fabrication. Presently with national corporation as assistant plant manager. Ready for advancement to plant manager or assistant to top management. Complete resume on request. Box 1-130.

METALLURGICAL ENGINEER: Graduate 1951, married. Experience in foundry control and development, industrial X-ray, precision castings, including lost wax process, research and development. Also experienced in new sands, nodular iron, heat treatment of nodular iron. Presently active in U.S.N. as engineering duty officer, in machinery inspection, including material control and expediting, engineering design and specifications. Expects release mid-1955. Desires production or production and development. Willing to relocate, except Southern states. Box 1-135.

METALLURGICAL ENGINEER: B. S. degree, age 40, married, two children. Broad experience in automotive parts manufacturing, including heat treating, plating, laboratory supervision, foundry control, process development, material specification, customer contact, quality control, machining and product research. Desires permanent position in research, production or technical sales. Complete resume available. Box 1-140.

METALLURGIST: B.S. degree, taking graduate courses, age 30. Four years experience in product development, failure analysis, production and metallography of ferrous and nonferrous metals. Desires responsible position. Prefers East. Box 1-145.

EXECUTIVE METALLURGIST-RESEARCH DIRECTOR: D.Sc. degree, with 25 years supervisory experience as process engineer on research, experimental, development and production problems. Specialist in fabrication methods, material testing, quality process control, heat treating, surface treating and heavy cold forming (extrusion) of ferrous and nonferrous metals and alloys. Outstanding record of achievement, experienced administrator, consultant and technical writer. Presently employed as director of research, desires to relocate. Interested in responsible and challenging position with progressive company. Box 1-150.

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